PB84-242593

Final Environmental Impact Statement
Proposed Wastewater Treatment Facilities
Greene County, Missouri

(U.S.) Environmental Protection Agency
Kansas City, MO

Jun 84

U.S. Department of Commerce
National Technical Information Service
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16. ABSTRACT

This final environmental impact statement addresses the social, economic, and natural environmental impacts potentially resulting from implementation of the proposed comprehensive wastewater treatment facilities presented in the Wastewater Facilities Plan for Greene County, prepared concurrently with this document. The Greene County planning area for these studies was divided into subareas, including the City of Springfield, six outlying communities, and the remaining unincorporated area.

Impacts of the recommended alternatives were generally found to be beneficial, particularly to surface and ground water quality and efficient land use planning. Mitigative measures are required to reduce adverse environmental impacts, including damage to riparian habitat and archaeological resources, potential problems in sinkhole, losing stream, and landfill areas, stream sedimentation, and erosion. Cost impacts to residents in presently unsewered areas will be great, despite efforts to reduce them. Cost impacts for residents of the sewered areas of Springfield will be moderate. Four of the outlying communities propose to deliver wastewater to the City of Springfield for treatment. This regionalization was found to be environmentally and economically sound.

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Environmental Protection
Agency

Region 7
324 East Eleventh St.
Kansas City, Mo. 64106

EPA 907/9-84-003
June, 1984

PB84-242593

Environmental Review

EPA

Final Environmental Impact Statement

Final

Proposed Wastewater Treatment Facilities Greene County, Missouri

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VII
324 EAST ELEVENTH STREET
KANSAS CITY, MISSOURI - 64106

TO: ALL INTERESTED AGENCIES, PUBLIC GROUPS, AND CITIZENS

Attached is a copy of the Final Environmental Impact Statement for Proposed Wastewater Treatment Facilities, Greene County, Missouri. This document has been prepared pursuant to Section 102(2)(c) of the National Environmental Policy Act of 1969 (Public Law 91-190). Any comments on this final EIS must be submitted to the Environmental Protection Agency (EPA) within 30 days after the Notice of Availability of this document is published in the Federal Register. The date of notification is anticipated to be about June 22, 1984; therefore, comments should be submitted by July 21, 1984.

Parties wishing to submit written comments on the final EIS may do so by mailing them to Edward C. Vest, EIS Coordinator, at the above address by the close of the review period. A Record of Decision, stating EPAs chosen action on the above project, will be published following the close of the 30-day review period.

Additional copies of the final EIS will be available for public review at the following locations.

Springfield Main Library
397 East Central
Springfield, Missouri 65802

Greene County Building
and Planning Department
833 Boonville
Springfield, Missouri 65802

Ash Grove Branch Library
101 East Main
Ash Grove, Missouri 65604

Republic Branch Library
135 South Highway 60
Republic, Missouri 65738

Hood-Rich Architects
and Consulting Engineers
801 South Glenstone
Springfield, Missouri 65802

Additional information on this document or the review period may be obtained from Thomas F. Lorenz (816) 374-5593 or FTS 758-5593.

Sincerely yours,

William Rice
for- Morris Kay
Regional Administrator

Attachment

FINAL
ENVIRONMENTAL IMPACT STATEMENT
PROPOSED WASTEWATER TREATMENT FACILITIES
GREENE COUNTY, MISSOURI

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION VII, KANSAS CITY, MISSOURI

JUNE 1984

APPROVED BY: William Rice
for- Morris Kay, Regional Administrator

Consultants
Sverdrup & Parcel and Associates, Inc.
St. Louis, Missouri

EXECUTIVE SUMMARY

In 1979, the Greene County Sewer District received a grant from the U.S. Environmental Protection Agency (EPA) to initiate comprehensive wastewater facilities planning for the Greene County planning area.* Since wastewater management and disposal in Greene County may have critical impacts on sensitive and valuable natural and man-made environmental resources, and could increase costs to local residents, EPA initiated this Environmental Impact Statement (EIS) to examine those potential impacts as a concurrent part of the planning process.

The Greene County planning area includes most of Greene County and a small part of Christian County and is located in southwest Missouri. The District retained Hood-Rich, an engineering and architectural consulting firm located in Springfield, to prepare the facilities plan and to coordinate public participation in the planning process. The planning area is divided into the Springfield, Battlefield, Brookline, Fair Grove, Republic**, Strafford, Walnut Grove, Willard, and Unincorporated Low-Growth subareas for analysis.

A. PROPOSED ACTIONS

For each subarea, a "no action" alternative and alternatives for new or modified wastewater collection and treatment systems were developed. The feasibility and costs of cluster systems and gravity, pressure, and vacuum sewer collection systems were assessed for unsewered areas, and treatment plant processes and alternative discharge points were evaluated. New collection facilities and improved wastewater treatment and management were considered for existing systems. The proposed improvements for each subarea are identified in the following list and Summary Figure.

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*The Greene County Sewer District was formed to sponsor wastewater facilities planning. Local plan approval and adoption, as well as facilities design, construction, and operation, remain the responsibilities of the individual municipalities in the planning area.

**The Republic subarea was recently withdrawn from the EIS study to expedite proposed project improvements. This action is in accordance with EPA's environmental review finding of no significant impact, dated April 9, 1984.

FACILITIES PLAN RECOMMENDATIONS
BY SUBAREA

Springfield Subarea

- Conduct a sewer system evaluation survey to locate areas of excessive inflow and infiltration.

Southern System:

The following are proposed to eliminate existing small treatment facilities and pump stations and to serve presently unsewered development:

- Construct Pierson Creek interceptor, interceptor extension, and contributing lines to deliver wastes to the Southwest Treatment Plant via the existing James River interceptor.
- Construct the Thompson Branch trunk, pump station, and force main discharging to the James River interceptor; also several smaller lines discharging directly to the James River interceptor.
- Construct several lines connecting to the existing Ward Branch trunk.
- Construct several lines connecting to the Wilsons Creek interceptor; also a line and pump station discharging to the Southwest Plant interceptor.

Recommendations with regard to treatment are as follows:

- Conduct pilot studies of further sludge stabilization prior to land spreading.
- Incorporate sludge treatment and disposal studies into overall solid waste management.
- Consider industrial reuse of Southwest Treatment Plant effluent with future expansion of Springfield's Southwest Power Plant.
- Analysis at this time suggests the James River pump station and Southwest Treatment Plant should be expanded when needed in the 1990's rather than constructing a new James River treatment plant to treat James River interceptor waste flows.

FACILITIES PLAN RECOMMENDATIONS
BY SUBAREA (continued)

Northern System:

- Construct a new Northwest treatment plant at the Murray site, about three miles downstream of the existing Northwest Plant.
- Construct the Little Sac River interceptor from the existing Northwest plant site to the new plant site.
- Construct the South Dry Sac interceptor.

Battlefield Subarea

- A collection sewer system within the city limits with pumping to Springfield's James River pump station and Southwest Treatment Plant.

Brookline Subarea

- A collection sewer system to serve much of the subarea with pumping to Springfield's Wilsons Creek interceptor and Southwest Treatment Plant.

Fair Grove Subarea

- A collection sewer system to serve most of the subarea and a treatment plant discharging to a tributary of the Pomme de Terre River.

Republic Subarea

- Collection system improvements within the city limits and replacing existing treatment facilities with a new plant nearby.

Strafford Subarea

- A collection system to serve most of the subarea with pumping to Springfield's southern system and Southwest Treatment Plant.

Walnut Grove Subarea

- A collection system and treatment plant serving most of the subarea is proposed. The proposed plant would discharge to Sugar Creek, a losing stream, since there are no cost-effective alternatives for discharge to a gaining stream.

FACILITIES PLAN RECOMMENDATIONS BY SUBAREA (continued)

Willard Subarea

- A collection system to serve parts of the subarea with pumping to Springfield's Airport Branch trunk and the Northwest Treatment Plant.

Unincorporated Low Growth Subarea

- Criteria for improved on-site systems are suggested for adoption and program implementation.

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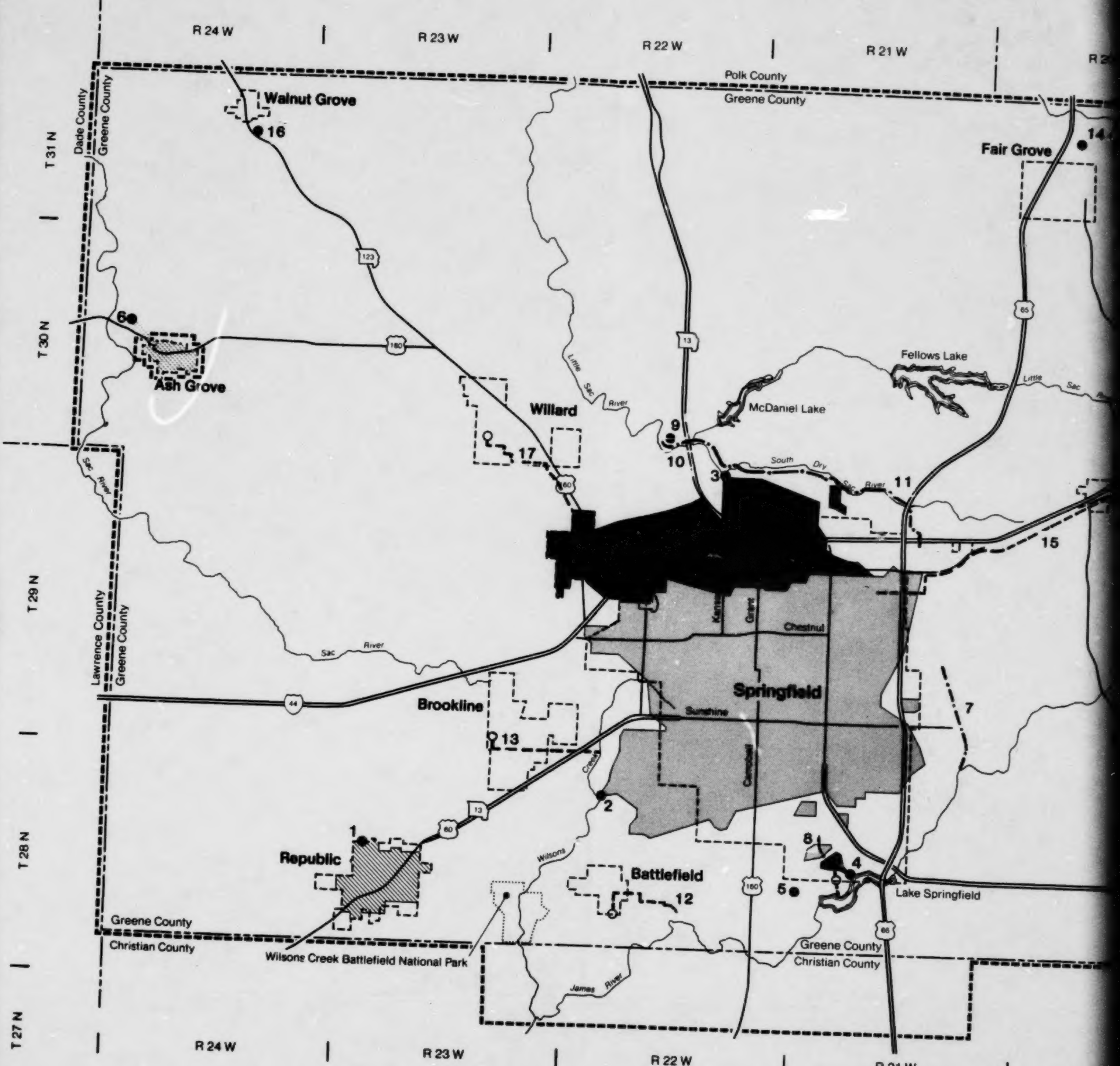
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Fair Grove
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Ash Grove
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Little Sac River
Willard
Fellows Lake
McDaniel Lake
Little Sac
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South Dry Sac River
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Sac River
Kansas
Grant
Chestnut
Springfield
Brookline
Sunshine
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Campbell
Creek
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Republic
Wilsons
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Battlefield
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5
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Lake Springfield
65
Wilsons Creek Battlefield National Park
James River

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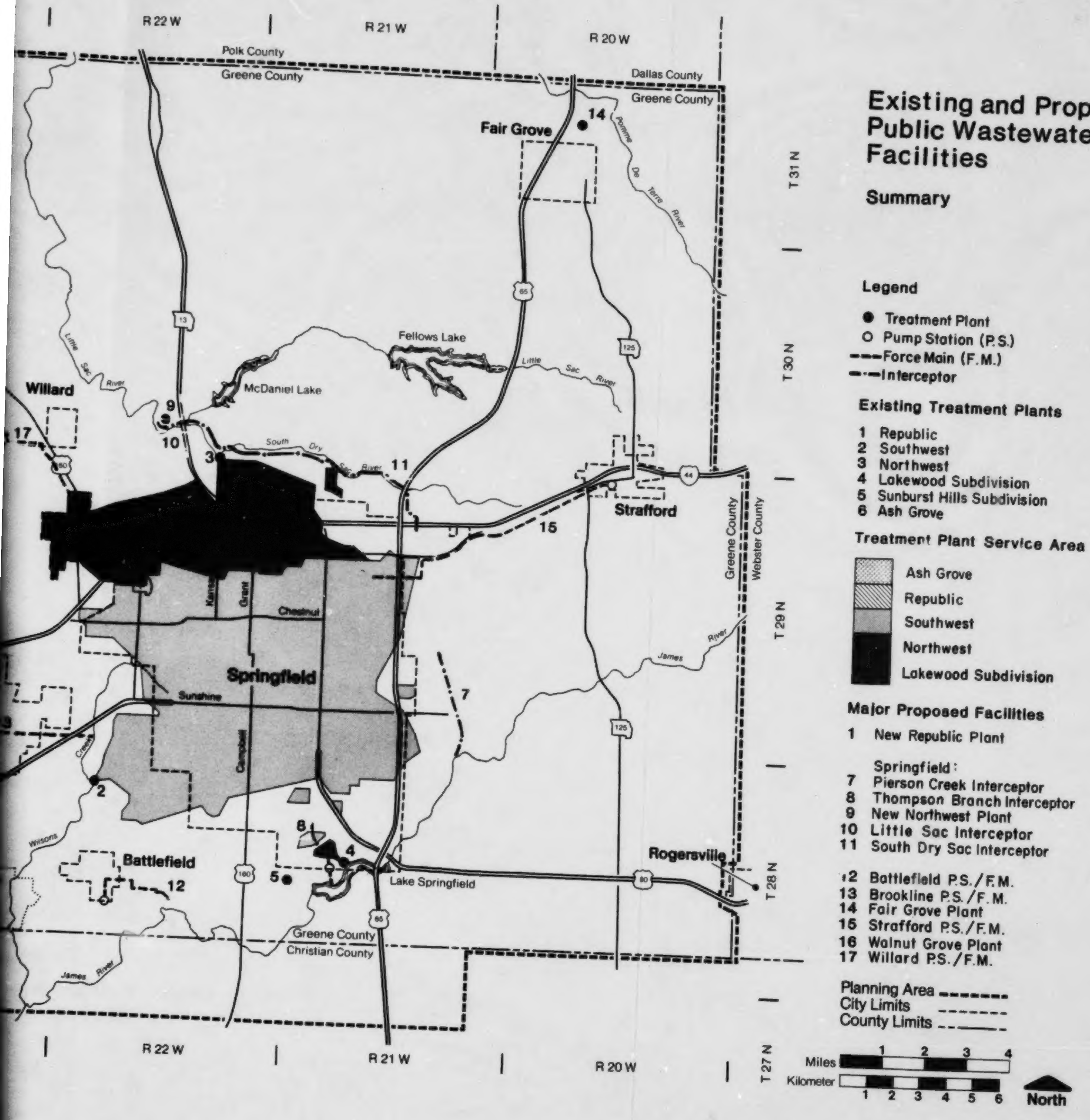

Existing and Proposed Public Wastewater Facilities

Summary

Legend
● Treatment Plant
○ Pump Station (P.S.)
Force Main (F.M.)
Interceptor
Existing Treatment Plants
1 Republic
2 Southwest
3 Northwest
4 Lakewood Subdivision
5 Sunburst Hills Subdivision
6 Ash Grove
Treatment Plant Service Area
Ash Grove
Republic
Southwest
Northwest
Lakewood Subdivision
Major Proposed Facilities
1 New Republic Plant
Springfield:
7 Pierson Creek Interceptor
8 Thompson Branch Interceptor
9 New Northwest Plant
10 Little Sac Interceptor
11 South Dry Sac Interceptor
12 Battlefield P.S./F.M.
13 Brookline P.S./F.M.
14 Fair Grove Plant
15 Strafford P.S./F.M.
16 Walnut Grove Plant
17 Willard P.S./F.M.
Planning Area
City Limits
County Limits
Miles
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2
3
4
Kilometer
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2
3
4
5
6
North
R 22 W
R 21 W
R 20 W
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T 30 N
T 29 N
T 28 N
T 27 N
Polk County
Greene County
Dallas County
Greene County
Webster County
Christian County
Fair Grove
Willard
Springfield
Strafford
Rogersville
Battlefield
Fellows Lake
McDaniel Lake
Lake Springfield
Little Sac River
South Dry Sac River
Pomme De Terre River
James River
Wilsons Creek
Kansas
Grant
Chestnut
Sunshine
Campbell
13
65
125
44
160
60

18

Impacts of the recommended alternatives will generally be beneficial, particularly to surface and ground water quality and efficient land use planning. The proposed alternatives would replace or eliminate inadequate wastewater treatment plants and provide suitable collection and treatment systems at communities with serious problems of failing septic tank systems. Four of the outlying communities propose to deliver wastewater to the City of Springfield system for treatment, and this regionalization was found to be environmentally and economically sound.

Some adverse impacts associated with the recommended alternatives will be relatively minor, and many will be of a short-term nature. These include the erosion, sedimentation, and damage to riparian habitat associated with sewer construction in stream corridors, and the traffic disruption, safety hazards, and noise caused by construction in urban areas. Proper mitigative measures as discussed in the Draft and Final EIS will minimize these impacts. There are also significant potential long-term or irreversible adverse impacts that warrant specific conditions for mitigation. These include measures to avoid or minimize the hazard of sewer line failure in sinkhole areas and avoid or minimize the effects of construction on archaeological resources.

Cost impacts of collection and treatment systems to residents of the unsewered subareas will be great, despite efforts to reduce costs and the potential for grant assistance. Officials and citizens of these communities have participated in the planning for these subareas and their views are generally reflected in the proposed plans. Cost impacts for residents of Springfield and Republic will be moderate.

B. AGENCY DECISIONS AND REQUIRED MITIGATIVE MEASURES

Facilities planning and this EIS analysis were performed concurrently and in coordination to help prevent environmentally poor choices. This EIS analysis has found that the environmental benefits of the proposed alternatives outweigh the adverse environmental effects by a significant margin. EPA therefore intends to provide further federal funding for these projects, subject to all other review and approval requirements of EPA's Construction Grants Program, as well as the requirements of the Missouri Department of Natural Resources (MDNR).

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During subsequent design and construction phases of the proposed projects, EPA will be responsible for seeing that recommended measures are taken to mitigate potential adverse impacts. The principal required mitigative measures are:

o The proposed force main from Willard to the Springfield northern system should be designed to minimize potential problems from sinkhole subsidence. A geotechnical survey should be required during the final design stage to identify the sinkhole areas, assess the subsidence potential, and recommend specific measures for mitigation. The use of ductile iron force main, as proposed, and pipe joints that provide flexibility without leakage are recommended. Flow and pressure monitoring and alarm systems should be provided as warranted.

o The proposed South Dry Sac, Little Sac River, and Pierson Creek interceptors, and the proposed Battlefield and Fair Grove facilities will have potentially significant impacts on prehistoric archaeological sites. The sites have been identified as potentially eligible for inclusion in the National Register of Historic Places. During the detailed design stage, the proposed facilities should be modified to avoid these sites, or, if avoidance is not possible, test excavations should be conducted to determine their significance. Mitigation of archaeological impacts should be coordinated with the Center for Archaeological Research, Southwest Missouri State University.

o Sedimentation and erosion control measures are particularly important during construction of the proposed Pierson Creek, South Dry Sac, and Little Sac River interceptors. These interceptors involve long lengths of streamside construction, numerous stream crossings, and potential reservoir or stream siltation. Strict stream crossing and sediment control specfications for construction of these facilities (and the preservation of a "green belt" along the waterways) should be prepared during the final design stage and followed during construction. Native vegetation should be replanted as discussed in the following item.

o Several interceptors will have significant impacts on bottomland forests, a valuable wildlife habitat. Facilities should be aligned to avoid these areas or disturb as little area as possible. Minimizing the width of construction corridors through these areas is recommended. These corridors should be regraded to natural contour and replanted with native vegetation. The Missouri Conservation Commission should be consulted in this regard and can help to provide for natural replanting.

- Design and implementation of the proposed project at Walnut Grove should include a program to monitor potentially affected private wells in the Sugar Creek receiving stream area. Periodic monitoring before and after project implementation is recommended.

- Mitigative measures will be required at two landfill sites which affect and are affected by construction of proposed Springfield northern system facilities. All environmental analyses, mitigative measures, and remedial actions required at the landfills will be determined by the EPA Superfund Program for hazardous wastes clean-up, and shall include any adverse impacts associated with the installation of the proposed Northwest treatment plant and Little Sac River interceptor. The implementation of remedial actions at the sites will not occur until after EPA completes a Remedial Investigation/Feasibility Study of the landfills.

GREENE COUNTY FINAL EIS
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I. INTRODUCTION

A. BACKGROUND OF THE FACILITIES PLAN

The objective of the Clean Water Act of 1977 and the Water Pollution Control Act of 1972 is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." To achieve this objective, the Acts authorize the U.S. Environmental Protection Agency (EPA) to make grants to local governments to assist in paying the costs of planning, designing, and constructing wastewater treatment facilities.

During the facilities planning phase, referred to as "Step 1," the local government defines the wastewater problems it hopes to solve through facilities construction; identifies alternative means of solving the problems, including alternative wastewater collection and treatment systems; analyzes the costs and environmental effects of the alternatives; and chooses the most economically and environmentally sound alternatives. Following approval of the wastewater facilities plan by the state and completion of the design, the local government may apply for the Step 3 grant for construction, which includes a standard allowance for design (formerly Step 2). Small communities may apply for a combined Step 2+3 grant, including a design allowance, upon approval of the facilities plan. Funding for all steps is dependent upon the priority assigned to the project by the state relative to other projects in the state.

The Greene County Sewer District was formed in 1977, and in 1979 received a Step 1 grant from EPA under Section 201 of the Water Pollution Control Act to initiate comprehensive wastewater facilities planning for the Greene County area. The facilities planning area covers all of Greene County except for Ash Grove and Rogersville, plus 26 square miles in north central Christian County (see Figure 1). Ash Grove has a suitable treatment facility, and the City of Rogersville, which is mostly in Webster County, is developing its own facilities plan.

The District retained Hood-Rich, an engineering and architectural consulting firm located in Springfield, to prepare the facilities plan and to coordinate public participation in the planning process. The planning area is divided into the Springfield, Battlefield, Brookline, Fair Grove, Republic, Strafford, Walnut Grove, Willard, and Unincorporated Low-Growth subareas for analysis.

In July 1983, Hood-Rich completed the draft Wastewater Facilities Plan for Greene County Sewer District, prepared concurrently and in coordination with this Environmental Impact Statement (EIS). Public hearings on the Draft Facilities Plan were held in July 1983 as part of the ongoing public participation program, and official agency reviews were conducted. With some resulting revisions, the final Facilities Plan was distributed in early March, 1984, and approved by the Missouri Department of Natural Resources on April 9, 1984. The Facilities Plan recommends specific collection and treatment facilities for implementation over the next 20 years for each planning subarea.

The Greene County Sewer District was formed to sponsor and coordinate wastewater facilities planning. Local approval and adoption of the respective plan elements, as well as facilities design, construction, and operation, remain the responsibilities of the individual municipalities or other local political jurisdictions.

B. BACKGROUND AND ISSUES OF THE EIS

The National Environmental Policy Act of 1969 requires that the federal government prepare an Environmental Impact Statement (EIS) for any major federal action that could significantly affect the environment. Approving the Greene County Facilities Plan and the subsequent design and construction grants would constitute such an action because of the scope of the plan and the cost that may be involved; because new and expanded sewer service may affect the pattern and rate of development, which could cause adverse community impacts; and because of the sensitive interaction between the area's ground water and surface water resources that may be affected by proposed facilities.

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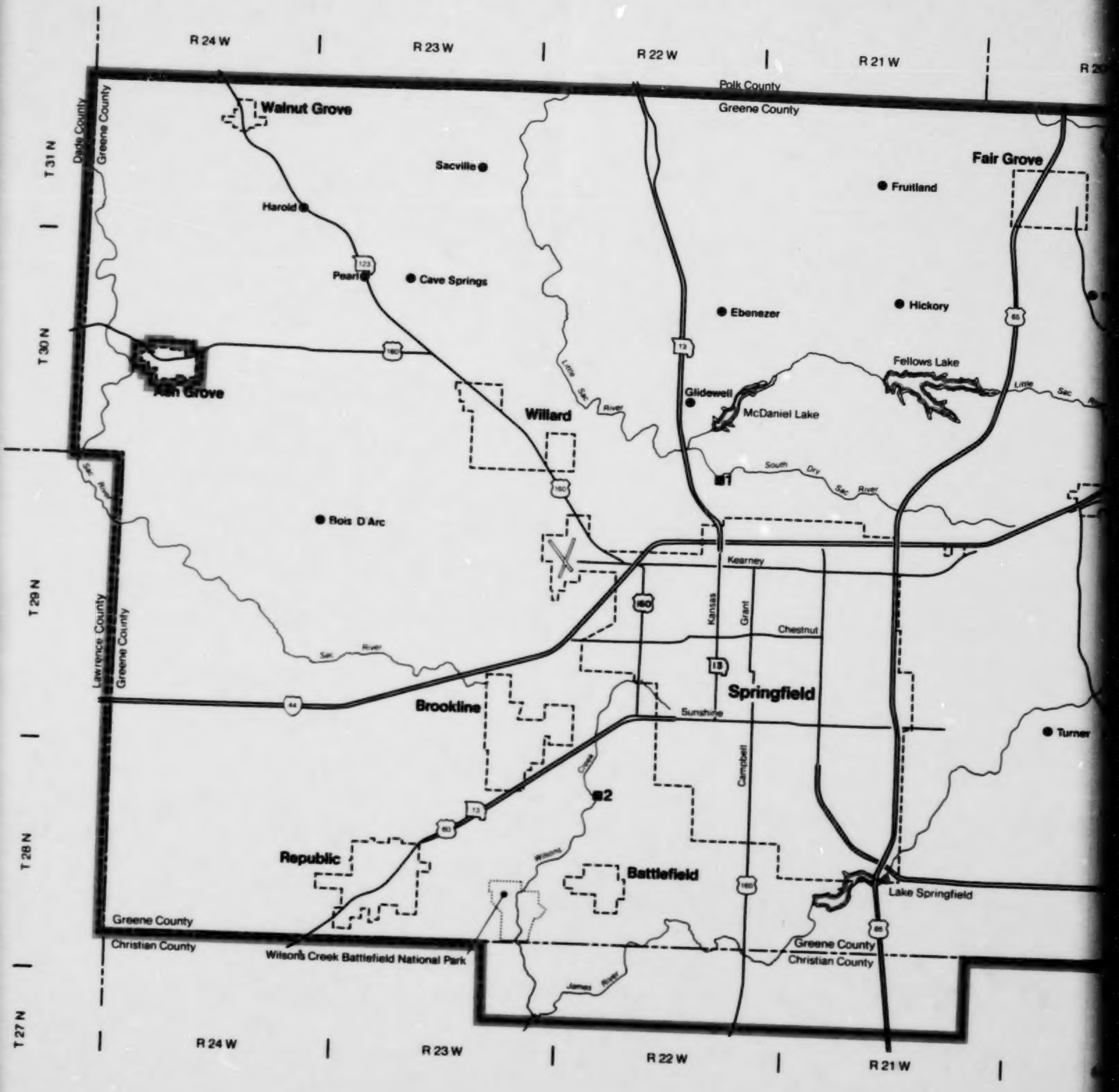
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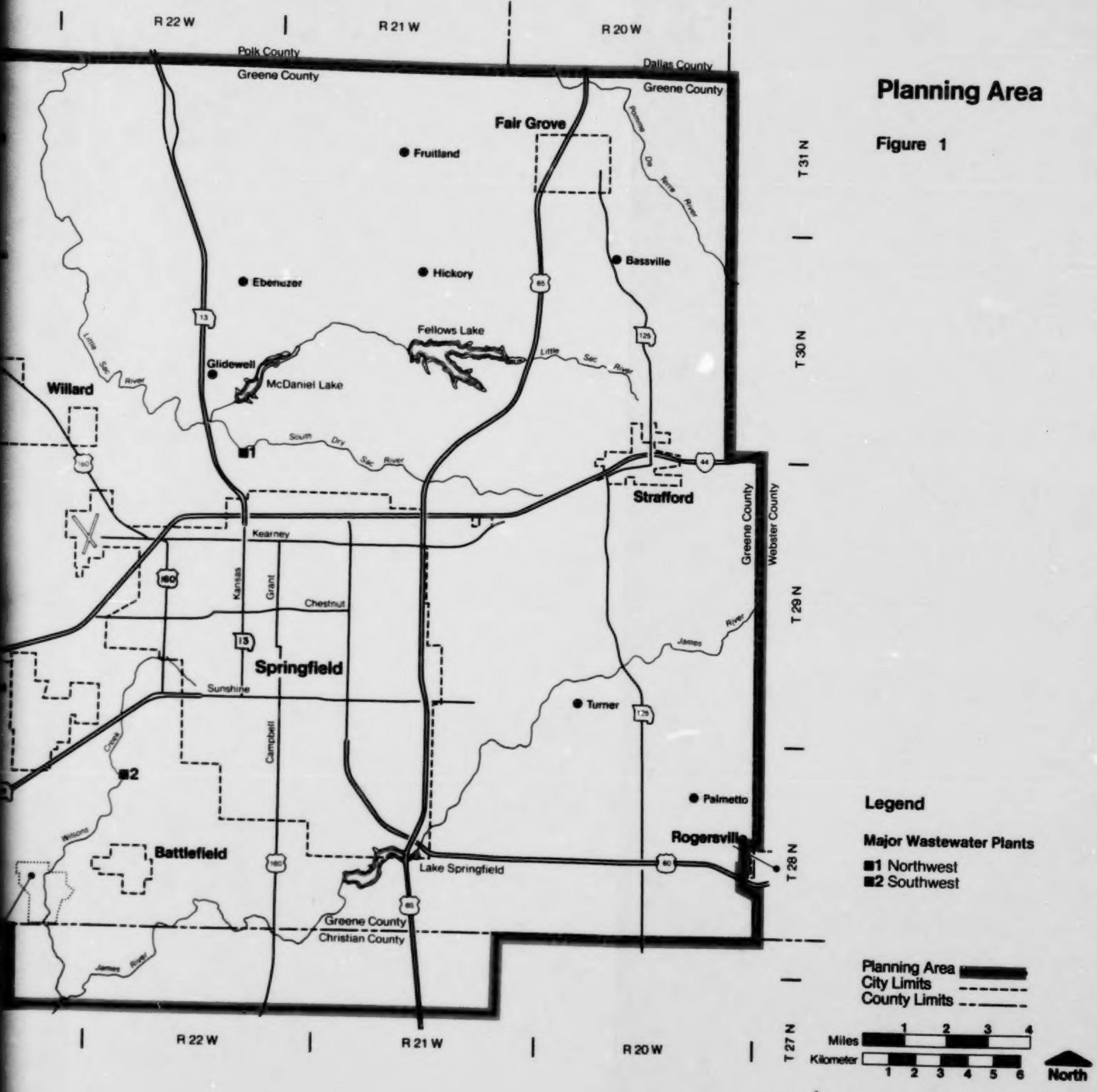
Planning Area

Figure 1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Legend
Major Wastewater Plants
■1 Northwest
■2 Southwest
Planning Area
City Limits
County Limits
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EPA therefore issued a notice of intent to prepare this EIS on the Greene County Facilities Plan and retained Sverdrup & Parcel and Associates, Inc., as a consultant.

The purpose of this EIS is to provide federal, state, and local decision makers and the concerned public with sufficient information on the environmental, economic, and technical impacts of the various alternatives to make sound wastewater management decisions. This EIS also presents the conditions which EPA will place on further federal grants for the design and construction of the proposed facilities. These grant conditions are to ensure that all construction resulting from these grants is in conformance with federal policies for protection of the environment.

To save time and allow better coordination among the involved parties, the EIS and Facilities Plan were prepared simultaneously. An Environmental Setting Report, the result of the first phase of EIS preparation, was distributed in January 1981 to aid in the planning. Hood-Rich then prepared population projections for each of the planning subareas in Greene County, and identified specific wastewater management alternatives and costs. The second phase of EIS preparation began when the alternatives identification and cost-effectiveness information for the draft Facilities Plan was available. The Setting Report was updated and used for the environmental evaluation of alternatives to produce the Draft EIS, which was distributed to interested agencies and citizens for review and comment in late January 1984. A public hearing on the Draft EIS was held on March 13, 1984 in Springfield. This Final EIS revises the Draft EIS in response to the public and agency comments received, and to recent developments regarding the final Facilities Plan.

In the course of the preparation of the EIS for Greene County, it became clear that it should focus on several major issues. These issues are briefly presented as follows:

1. Direct Effects on Sensitive Environmental Features

A principal concern of the EIS is the determination of the primary impacts on the sensitive environmental features of the Greene County planning area, such as floodplains, sinkholes, losing streams,

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wetlands, forests, prime farmlands, undisturbed prairie, rare and endangered species, historic and prehistoric sites, and drinking water supplies.

2. Induced Development in Outlying Areas

In order to encourage efficient patterns of development, sewerage facilities planning should be coordinated with plans for the provision of transportation, schools, and other necessary community services and utilities. The EIS examines the compatibility of the sewerage facilities plan with the other growth management plans of the area.

3. Effects of Inadequate Treatment and Sewer System Inflow and Infiltration

Some treatment plants in the area are overloaded, poorly operated, or not designed to meet current treatment requirements. Overflow of sanitary sewers and treatment plant by-passing during wet weather is a significant problem at existing central collection and treatment systems

4. Pollution from Failing Septic Tank Systems

Most of the smaller communities in the planning area are unsewered and serious septic tank effluent surfacing and ground water pollution problems have been experienced.

5. Economic Impact of the Proposed Projects

A very significant impact of the proposed projects is the cost to local residents. This issue was voiced during the course of the Facilities Plan public participation program.

C. ORGANIZATION OF THIS DOCUMENT

This Final EIS responds to comments on the Draft EIS and summarizes and updates information previously presented. The Executive Summary presents a synopsis of the proposed Facilities Plan actions, environmental impacts, EPA's decisions, and mitigative measures. Section II summarizes the EIS study information and alternatives, but does not repeat the full text of the Draft EIS. Section III indicates revisions to the Draft EIS without repeating the text of the Draft EIS.

Section IV presents the written and public hearing comments on the Draft EIS and EPA responses. The Draft EIS may be consulted for added details and references in regard to the EIS analysis.

II. EIS STUDY SUMMARY

A. ENVIRONMENTAL SETTING

1. Geology and Soils

The planning area is within one of the Ozark plateaus and has gently rolling topography except for steeper terrain along the major streams. The area is underlain by cherty carbonate rocks which are subject to solution activity. These carbonate rocks, especially those with coarser crystalline structure, have been extensively dissolved by downward-percolating water that is actually very dilute carbonic acid. This acid originates from atmospheric carbon dioxide absorbed by rainfall, from decaying surface vegetation, and from shales with acid leachate. The cracks, joints, fissures, bedding planes, and chert beds in the bedrock facilitate penetration by the mildly acid water percolating underground, permitting it to cut crevices, solution channels, caverns, and cave passages. This solution activity results in a topography referred to as "karst."

Karst topography is characterized by sinkholes and related collapse structures, caves, springs, losing streams, and an irregular bedrock surface of "cutters" and "pinnacles." These cutters and pinnacles are solution crevices and isolated pillars of rock, commonly marked by 10 to 15 feet of relief in the bedrock surface. Approximately 20 to 30 percent of Greene County drains into sinkholes and almost all of the county is underlain by some feature of the Karst topography. All of these features have a direct bearing on the planning of wastewater treatment facilities in the planning area.

There are some 235 caves in Greene County. Crystal Cave and Fantastic Caverns are operated commercially as tourist attractions. Fantastic Caverns was identified in 1979 by the U.S. Heritage Conservation and Recreation Service as a potential national natural landmark. The cave is a habitat for three species of animals on the Missouri list of rare and endangered species.

The planning area has many types of soils, but most of them have moderate to severe limitations for septic systems because of low

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soil permeability, shallow bedrock, high rock content, flooding potential, or proximity to sinkholes or other unfavorable geologic formations. Many of the soils in the area are classified as "prime farmland" by the Soil Conservation Service and, as such, are a valuable natural resource for agricultural productivity.

2. Water Resources

The planning area is divided between two drainage basins - the Osage River basin to the north and the White River basin to the south. The line that divides the two basins crosses Greene County from Republic to Strafford, roughly following the route of the Burlington Northern (formerly the St. Louis and San Francisco) Railway. The area's location on a drainage divide has important water resources and water quality implications. Since streams originate near divides, those in the planning area are small, limiting water supply resources and flows to assimilate pollutants.

The major streams of the White River Basin in Greene County are the James River and Wilsons Creek.* The White River basin covers the southern part of Greene County, including 80 percent of the City of Springfield. Runoff from Springfield is carried principally by Wilsons Creek, which enters the James River in Christian County near the southern boundary of the planning area.

Streams in the northern and western areas of Greene County discharge into the Sac River or the Pomme de Terre River, both tributaries of the Osage River. The major tributaries of the Sac River in Greene County are Pickerel Creek, Clear Creek, Asher Creek, the Little Sac River, the South Dry Sac River, and the North Dry Sac River. The Little Sac River originates northeast of Springfield and flows westward into Fellows Lake and then into McDaniel Lake. These impoundments were built for drinking water supply use of the City of Springfield. Their drainage areas are about 22 square miles and 20 square miles, respectively.

The Little Pomme de Terre and the Pomme de Terre rivers drain the northeast corner of Greene County. They flow northwest, and converge about two miles north of Greene County.

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*As the creek name, the correct spelling is "Wilsons"; as the name of the battlefield park, it is "Wilson's."

Ground water resources in the planning area are comprised of a major (deep) aquifer and a minor (shallow) aquifer, separated by the Northview formation that retards the movement of water between the two. The shallow ground water and surface waters are closely connected. Streams recharge ground water during high flows, and the major streams are supplemented during drought periods by flows from springs. There are many "losing streams" in the area which naturally lose much of their flow into the ground water. Sinkholes and other recharge features also provide a direct connection between the surface and the upper aquifer. In the planning area, the ground water in the lower aquifer generally moves northwest following the structural dip of the bedrock away from the Ozark uplift. A ground water divide, however, is located at approximately the Greene-Christian county line, and ground water to the south of this divide moves in a southerly direction, generally following the dip of the bedrock.

Understanding ground water movement in the minor aquifer is important, because the large number of surface-subsurface connections facilitate movement of surface water pollutants into the groundwater. Dye traces have been conducted by the Missouri Geological Survey and others to determine ground water flow patterns. Dyes have been traced from introduction points in sinkholes, streams, and sewer lines to caves, springs, and streams. This approach has yielded limited information mainly because of the multitude of underground connections in the area and because the studies have only been undertaken in response to isolated complaints of pollution. Until there is comprehensive testing of streams, sinkholes, sewer lines, etc., throughout the planning area, it will be necessary to extrapolate or postulate flow lines in areas lacking positive testing.

Normally, ground water movement is, of course, downward in response to gravity. Water levels in the minor aquifer are generally higher than those in the major aquifer; therefore, potential movement is downward. However, the Northview Formation retards downward water movement and acts as an upper confining layer to the major aquifer. Water movement to the major aquifer can occur where the Northview is breached either by natural means such as joints and faults or by artificial means such as uncased or improperly cased wells.

3. Terrestrial and Aquatic Ecology

The planning area occurs in the transition zone between the Ozark plateaus and the Osage plains. The Ozark plateaus possess the most diversified flora in Missouri. Within the broad transition zone, Ozark flora is dominant on the broken rocky ground along streams, while the prairie and plains flora occupies the more level and open sections of the uplands. Because of the diversified habitats found in the planning area, much of the wildlife that once occurred in either the Ozark plateaus or Osage plains has dispersed in both regions.

Many of the streams in the area are characteristic of very clear Ozark streams. Prairie streams are more turbid and most evident along the western edge of the area. Native fish are distributed according to stream systems. Often a species that is widespread and abundant in one stream system is absent from an adjacent stream basin, although the habitats are similar. While streams may be only a few miles apart by land, they can be hundreds or thousands of river miles apart. Thus, a fish in the Sac River in Greene County would have to swim over 1,500 miles to enter the James River in the same county. As a result, separate populations may slowly evolve into subspecies or separate species. The Niangua darter, Etheostoma nianguae, is restricted to the southern tributaries of the Osage River and is listed by the State of Missouri as RARE and is proposed for federal listing as THREATENED.

A distinctive feature of karst topography is the cave and the unique aspects of the cave environment appear in the species found in the deep interior. Cambarus setosus is a blind, white crayfish endemic to subterranean waters in southwestern Missouri. The Ozark cavefish, Amblyopsis rosae, is a blind cavefish that has been collected only from underground streams in southwestern Missouri and northwestern Arkansas. The blind cave salamander, Typhlotriton spelaeus, is a species unique to the Ozarks. The Ozark cavefish is listed as RARE by the State of Missouri and is expected to be federally listed as THREATENED by late 1984. The cave crayfish, Cambarus setosus, is also on Missouri's list of rare and endangered species. Cave organisms are very sensitive to pollution or other changes in their stable environment.

4. Water Quality

The quality of the surface water and ground water of an area is an integral part of its natural environment, and, in turn, its human environment. The consequences of not protecting water quality can be very serious. Some pollutants, including various toxic chemicals, are not effectively removed by conventional drinking water treatment systems and may pose a threat to health. Contamination with bacteria, viruses, and other pathogenic organisms may result in water-borne disease outbreaks if treatment is inadequate. Many public and private well supplies receive little or no treatment and thus rely on the purity of the water source. Water treatment costs rise as additional treatment processes are required to remove pollutants from the water supply source. In addition to municipalities, many industries, from food processers to power plants, require a dependable source of clean water for use in production processes and for cooling. Most fish and wildlife species cannot survive in areas where the water is severely polluted. Recreational opportunities can also be curtailed.

Before 1978, the White River basin streams immediately downstream of Springfield had poor overall water quality. Wilsons Creek was severely degraded; water quality standards were consistently violated; and to the casual observer, the creek appeared dark in color, gave off an offensive odor, and was unable to support any aquatic life. The creek was so polluted it offended visitors to the Wilson's Creek Battlefield Park. Several fish kills had occurred in the James River in Christian County, downstream of the planning area. At the time of these poor water quality conditions, the major sources of pollutants to Wilsons Creek were Springfield's Southwest Wastewater Treatment Plant and the city's storm runoff.

The water quality of Wilsons Creek and the James River dramatically improved after the Southwest Treatment Plant was upgraded in 1977. The U.S. Geological Survey in 1980 concluded that, under normal flow conditions, there are no statistically significant differences in water quality between the stations on Wilsons Creek upstream and downstream of the Southwest Plant. Sludge deposition in Wilsons Creek downstream of the plant was eliminated when the plant was upgraded.

Nevertheless, water quality standards are still violated. During storms, polluted urban runoff and infrequent bypass flows from the Southwest Treatment Plant are carried into Wilsons Creek. Phosphate, a nutrient which is not removed by the Southwest Plant, is still present at high levels in the James River downstream of its confluence with Wilsons Creek, as is nitrate, a treatment process by-product.

The Osage River basin streams in Greene County are affected by fewer water quality problems than the White River basin portion of Greene County. Two Osage River basin impoundments (McDaniel Lake and Fellows Lake) are used as sources of Springfield's drinking water and are of good quality.

Water quality problems in the Little Sac River basin in Greene County are caused by discharges from Springfield's Northwest Wastewater Treatment Plant and by leachate from abandoned landfills in the floodplain of the Little Sac River. The impact of the Northwest plant's effluent is more significant than that of the landfill leachate and is greatest during low stream flows, whereas the impact of the seepage from the landfill is greater during higher flows.

The Missouri Clean Water Commission sets effluent standards for point-source discharges to prevent the violation of water quality standards for the receiving stream. A permit is issued for each point-source discharge, which defines its applicable effluent standards and the required discharge sampling frequency. There are five publicly-owned municipal wastewater treatment facilities in the planning area, four of which are operated by the City of Springfield and the other serves the City of Republic (see Table 1). The Northwest and Southwest plants serve the city's population and are the most significant individual point sources in the area. Other plants serve the Lakewood Village and Sunburst Hills subdivisions. There are 21 other domestic, commercial, and institutional wastewater point sources in the planning area, serving mobile home parks, schools, subdivisions, shopping centers, and other developments (see Table 2). Most treat their wastes in aerobic lagoons or small aeration plants. Many of the facilities have periodically failed to meet their effluent limitations. None of these alone are a significant individual point source of discharge, but collectively

TABLE 1
MUNICIPAL POINT SOURCE DISCHARGERS

Facility	Design Flow (mgd)	Receiving Stream	Permit Limits (a)(b)		Treatment
			Item	Day/Wk/Mo	
OSAGE RIVER BASIN					
Ash Grove Treatment Facility (not in planning area)	0.33	Tributary of Sac River	BOD SS	30/-/- 30/-/-	Oxidation ditch, Clarifiers
Northwest Wastewater Treatment Plant, Springfield	3.5	Pea Ridge Creek and Little Dry Sac Creek	BOD SS FC DO(c)	15/-/- 15/-/- 200/-/- 6.0/-/-	Primary treatment, aeration and reaeration tanks, final clarifiers, chlorination
Republic Municipal Wastewater Treatment Facility	0.75	Pickerel Creek	BOD SS	30/-/- 30/-/-	Contact stabilization plant, 3-cell lagoon, chlorination
WHITE RIVER BASIN					
Lakewood Village Subdivision, Springfield	0.06	Tributary of Lake Springfield	BOD SS FC	-/30/20 -/30/20 200/-/-	Contact stabilization plant, chlorination
Southwest Wastewater Treatment Plant, Springfield	30	Wilsons Creek	BOD SS FC Ammonia	10/-/- 10/-/- 200/-/- 2/-/-	Primary treatment, pure oxygen aeration, secondary clarification, nitrification, final clarification, filtration, ozonation
Sunburst Hills Subdivision, Springfield	0.015	Tributary of Lake Springfield	BOD SS FC	-/45/30 -/45/30 200/-/-	Ext. aeration plant, chlorination, dechlorination

(a) Most permits also limit pH within the range of 6.0 to 9.0.

(b) BOD - biochemical oxygen demand (mg/l); SS - suspended solids (mg/l); FC - fecal coliform (per 100 ml); DO - dissolved oxygen (mg/l); Ammonia (mg/l).

(c) Minimum DO of 6.0 mg/l or 80% of saturation, whichever is least.

TABLE 2
DOMESTIC, INSTITUTIONAL, AND COMMERCIAL POINT SOURCE DISCHARGERS

Facility	Design Flow (mgd)	Receiving Stream	Permit Limits (a)(b) Item	Permit Limits (a)(b) Day/Wk/Mo	Treatment
OSAGE RIVER BASIN					
Fair Grove School	0.024 (0.026 actual)	Tributary of Pomme de Terre River	BOD SS	45(c)/-/- 30(c)/-/-	Septic tank, sand (rock) filter, laterals
Hood's Service Center (I-44 & Hwys PP and K)	0.0057	Tributary of Pickerel Creek	BOD SS	30/-/- 30/-/-	2-cell lagoon, (No discharge reported)
Lakewood Mobile Home Park (being connected to Springfield system)	0.020	Tributary of Dry Sac Creek	BOD SS FC	-/45/30 -/45/30 200/-/-	1-cell lagoon, ext. aer. plant, chlorination
Springfield "44" Auto/ Truck Stop (Strafford)	0.013	Tributary of Little Sac River	BOD SS FC	-/45/30 -/45/30 200/-/-	Holding basin, ext. aer. plant, 1-cell lagoon, chlorination
Willard Laundromat and Carwash	0.007	Tributary of Clear Creek	BOD SS	30/-/- 30/-/-	1-cell lagoon
Willard Retirement Village	0.0024	Clear Creek	BOD SS FC	5/15(c)/10(c) 10/20(c)/15(c) 200/-/-	Four home treatment units, open sand filters, chlorination, (two treatment units, sand filters, and chlorination being added)
The Willows Subdivision (near Republic)	0.045	Pond Creek	BOD SS FC	-/15/10 -/20/15 200/-/-	Ext. aer. plant, sand filter, chlorination
WHITE RIVER BASIN					
American Laundry (Springfield)	0.009287 (softener backwash)	South Branch of Jordan Creek	SS Sodium chloride	30/-/20	None

TABLE 2 (Cont'd)
DOMESTIC, INSTITUTIONAL, AND COMMERCIAL POINT SOURCE DISCHARGERS

Facility	Design Flow (mgd)	Receiving Stream	Permit Limits Item	Permit Limits Day/Wk/Mo	Treatment
Coronado Mobile Home Park (Springfield)	0.0158	Sequiota Branch	BOD SS	30/-/- 30/-/-	1-cell lagoon (usually no discharge reported)
English Village Park (Christian County)	0.08025	Tributary of James River	BOD SS	-/45/30 -/45/30	Ext. aer. plant, chlorination
Federal Medical Center (Springfield)	0.016 (Softener regenerant)	South Creek	Set S Chloride	0.3/-/0.3 375/-/250	None
General Council of Asemblies of God (Springfield)	0.18 (Cooling Water)	Jordan Creek	Temp	90/-/-	None
Hi-View Mobile Home Park (Sewer District formed and petitioned for connection to Springfield - Wilsons trunk)	0.039	Wilsons Creek	BOD SS FC	5/-/- 10/-/- 200/-/-	1-cell lagoon
Hickory Hills Country Club	0.010	Tributary of Pierson Creek	BOD SS FC	-/15/10 -/20/15 200/-/-	Ext. aer. plant sand filters, chlorination
Holyoke Park Subdivision	0.0044	Workman Branch	BOD SS FC	-/15/10 -/20/15 200/-/-	Ext. aer. plant, sand filter, chlorination (No discharge reported)
Ozark Park-A-Home (Under litigation with MoDNR)	0.045	Tributary of Ward Branch	BOD SS FC	5/-/- 10/-/- 200/-/-	2-cell lagoon
Prairie View Heights Subdivision	0.050	Tributary of Wilsons Creek	BOD SS FC	5/-/- 10/-/- 200/-/-	Ext. aer. plant, pressure filter, chlorination

TABLE 2 (Cont'd)
DOMESTIC, INSTITUTIONAL, AND COMMERCIAL POINT SOURCE DISCHARGERS

Facility	Design Flow (mgd)	Receiving Stream	Permit Limits		Treatment
			Item	Day/Wk/Mo	
St. John's Regional Center (Springfield)	0.002 (Softener regenerant)	Fassnight Creek	Set S Chloride	0.3/-/0.2 375/-/250	None
Timbercrest Mobile Home Park (Springfield)	0.0269	Thompson Branch	BOD SS	-/45/30 -/80/60	2-cell lagoon (Little or no discharge)
Village Subdivision	0.045	Wilsons Creek	BOD SS FC	-/15/10 -/20/15 200/-/-	Ext. aer. plant, filter, chlorination
Wilson's Creek National Battlefield Park	0.015	Wilsons Creek	BOD SS FC	-/15/10 -/15/10 200/-/-	Chemical add'n, mixing, flocculation, clarification, carbon adsorption, pressure sand filtration, chlorination

(a) Most permits also limit pH within the range of 6.0 to 9.0.

(b) BOD - biochemical oxygen demand (mg/l); SS - suspended solids (mg/l); Set S - settleable solids (mg/l); FC - fecal coliform (per 100 ml); Temp - temperature (°F); Chloride (mg/l).

(c) Proposed permit limit.

they contribute to the localized degradation of the area's surface and ground waters. Twelve industries discharge directly to surface waters in the planning area (see Table 3). Most of the industries discharge cooling waters and are located in the White River basin. The industries have generally been in compliance with effluent requirements.

Nonpoint pollutants are defined as "any material for which no NPDES permit can be issued, which enters waters of the state and is detrimental to the uses for which that water has been designated." Studies of Springfield area surface waters in both drainage basins have indicated that nonpoint sources are significant, if undefined. While most nonpoint pollutant sources have their biggest impact on surface waters during storms, several sources also discharge pollutants in continuous, unmeasurable amounts. The major sources of nonpoint pollutants in Greene County may be classified as urban, agricultural, or industrial.

Urban nonpoint sources of pollutants include uncollected stormwater runoff, effluent from septic tanks, and seepage from domestic wastewater treatment lagoons. Urban stormwater runoff is the most significant of these. It contains high amounts of organics and suspended solids, and concentrations of a variety of metals and pesticides. Stormwater runoff has been shown to have a severe, acute impact on Wilsons Creek and the James River. Surges of runoff were found to have caused fish kills in the James River downstream of Greene County. However, much of the pollution was shown to be restricted to the initial flow of stormwater in Wilsons Creek, due to the coincidence of high water temperatures, high toxic chemical concentrations, and extremely low dissolved oxygen content.

Urban stormwater runoff is a major pollutant source in Greene County for a number of reasons. First, the area has undergone rapid development over the past few years, increasing the volume of runoff by increasing the amount of impervious (paved) surface. Urbanization also decreases the quality of stormwater runoff. Second, Springfield's urban runoff problems are aggravated by a stormwater sewer system that was constructed before a proper regard for land use and geology became an integral part of sewer planning. Third, the area's karst topography is

TABLE 3
INDUSTRIAL POINT SOURCE DISCHARGERS

Facility	Design Flow (mgd)	Receiving Stream	Permit Limits (a)(b) Item	Day/Wk/Mo	Treatment
OSAGE RIVER BASIN					
Griesemer Stone Co. (Springfield)	(Stormwater at quarry)	Tributary of South Dry Sac River	SS	75/-/50	None - Water pumped out
WHITE RIVER BASIN					
Ash Grove Cement (Springfield)	0.006-Cooling Water	Sequiota Creek	SS Set. S O&G	-/45/30 -/0.3/0.2 -/20/15	-
	0.001-Sanitary wastewater	Sequiota Ceek	BOD SS FC	-/45/30 -/45/30 200/-/-	Ext. aer. plant, chlorination
	Storm runoff-limit on oil emulsion for dust control				
Dayco Corporation Springday Co., (Springfield)	-	South Creek	SS O&G Temp.	30/-/- 10/-/- 90/-/-	Settling basin, oil skimmer
General Electric	0.625 Cooling water and boiler blowdown	Tributary of Galloway Branch	SS Temp.	45/-/30 90/-/-	-
James River Power Plant	135 Once-through cooling water	Lake Springfield	Chlorine Temp	0.5/-/0.2 100/-/100	-
	3.0 Ash pond overflow		SS O&G	100/-/30 20/-/15	-
	- By-pass		Chlorine	0.5/-/0.2	-
Kraft Foods Co. (Springfield)	0.1695 Cooling and boiler blowdown (0.1325 actual)	Fassnight Creek	SS$^{(c)}$ O&G$^{(c)}$ Temp$^{(c)}$	45/-/30 20/-/15 90/-/-	-

TABLE 3 (Cont'd)
INDUSTRIAL POINT SOURCE DISCHARGERS

Facility	Design Flow (mgd)	Receiving Stream	Permit Limits Item	Permit Limits Day/Wk/Mo	Treatment
Lily Division, Owens Illinois (Springfield)	0.0108 Cooling water	Tributary of Jordan Creek	O&G	15/-/-	-
			Temp	90/-/-	
			Surfactants	1/-/-	
Mid-America Dairymen, Inc. (Springfield)	0.180 Cooling water	Jordan Creek	SS	45/-/30	-
			Temp	90/-/-	
Paul Mueller Co. (Springfield)	0.070 Cooling water, average	Jordan Creek	COD	100/-/75	-
			Set S	0.3/-/0.2	
			O&G	20/-/15	
			Temp	90/-/-	
Southwest Power Station	Coal, limestone storage runoff	Tributary of Wilsons Creek	SS	50/-/-	(No discharge reported)
	0.68-Drains, ash transport, cooling		SS	100/-/30	-
			O&G	15/-/10	
			Chlorine	0.5/-/0.2	
			Temp.	100/-/95	
	Landfill leachate		SS	50/-/-	-
	Stormwater runoff		SS	50/-/-	-
Springfield Regional Stockyards	Stock trough overflow and runoff	Tributary of Wilsons Creek	BOD	-/15/10	-
			SS	-/20/15	
			FC	200/-/-	
Syntex Agribusiness, Inc. (Springfield)	0.104-Cooling water and boiler blowdown, average	Jordan Creek	SS	45/-/30	-
			Temp	-/-/90	

(a) Most permits also limit pH within the range of 6.0 to 9.0.

(b) BOD - biochemical oxygen demand (mg/l) SS- suspended solids (mg/l); Set S - settleable solids (mg/l); FC - fecal coliform (per 100 ml); O&G - oil and grease (mg/l); COD - chemical oxygen demand (mg/l); Temp - temperature (°F); Chloride (mg/l).

(c) Proposed permit limit.

not compatible to urbanization. The numerous sinkholes in the area tend to channel flows directly to the ground water until the sinkholes clog, at which time they flood. In addition to these effects of natural drainage, Springfield's stormwater drainage system was designed in the past to use sinkholes as artificial receptacles. Improved land use planning practices will help avert such drainage problems in newly developed areas; however, present problems are likely to remain.

Septic tanks are major sources of organic and bacterial pollutants in Greene County. They are significant where they are highly concentrated, such as near Springfield, and where geologic conditions are poor. In areas with sinkholes, rock fractures, or poorly permeable soils, the septic tank effluents are not sufficiently treated by filtration through the soil but are instead channeled directly to the ground or surface water. Pierson and Sequiota Creeks have contained concentrations of coliform bacteria many times those concentrations expected from natural sources, with septic tank effluent the suspected cause.

Agricultural sources are significant dischargers of pollutants to surface waters in outlying areas of Greene County. Agricultural runoff contributes high amounts of nutrients to the planning area's surface waters, causing excessive plant growth.

Industrial sources sometimes discharge pollutants beyond those covered by their discharge permits, through runoff, accidental spills, and improper design or operation of treatment facilities. Industrial runoff adds chemicals to urban runoff, and thus increases its impact on surface waters.

The danger of ground water pollution in karst regions is much greater than in areas protected by overlying impervious deposits or deposits capable of natural filtration. Flow velocity in karst formations is generally greater than in normal soils and bedrock, and thus contaminated water is not adequately filtered for self-purification. All of Greene County is affected by the water quality of its aquifers - those underground rock formations that contain the area's ground water. Industrial, municipal, and many private water supplies derive their water from aquifers. Urban growth has intensified the demand for high quality ground water and increased the possibilities for its contamination. For example, Springfield plans to develop an industrial park in an area that is extremely susceptible to contamination of ground water supplies. The result of the increased urban development and the consequently greater demand for ground water is an increase in the number of contaminated wells and aquifers, or parts of aquifers, and in the potential for ground water contamination throughout the area (see Figure 2).

The present quality of the ground water in the Springfield area may be described as generally good, but with localized contaminated areas. Two aquifers in particular are becoming polluted, the "upper" or "shallow" aquifer, and the Swan Creek Sandstone member in the lower aquifer. Numerous connections between the upper aquifer and the surface have developed by weathering, and improperly constructed wells. These passageways allow rapid movement of surface water to the ground water. The Swan Creek Sandstone forms the upper layers of the lower aquifer and lies below the Northview Shale, which is the relatively impervious layer separating the upper and lower aquifers. The Swan Creek Sandstone has been degraded by poorly constructed wells that allow surface contaminants to be transported into the ground water.

Wells that tap the shallow aquifer or the Swan Creek Sandstone aquifer are extremely susceptible to contamination. Many private wells in Greene County have been contaminated by pollution from such sources as urban and agricultural runoff, septic tank effluent, leachate from improperly sealed industrial and municipal wastewater treatment lagoons, and solid waste landfills. In 1970, a study of 50 wells in Springfield found 42 percent with bacteria levels over the drinking water standard. Studies in 1974 and 1980 of 106 Springfield area private wells and 130 wells in unincorporated Greene County, respectively, found 26 and 28 percent were similarly contaminated. According to the MDNR, 31.6 percent of the wells in Greene County were declared unsafe in 1977. The number of contaminated wells discovered during the Springfield-Greene County Health Department's routine voluntary sampling of private wells varies between 25 and 30 percent. Many of the private wells in the Springfield area are improperly built and cased, and penetrate the upper aquifer or the Swan Creek Sandstone. The areas of highest coliform concentrations in 1972 were wells in the west, northwest, south, and southeast areas of the city. The 1980 study found problem areas to the west, northwest, and the urbanized periphery of Springfield.

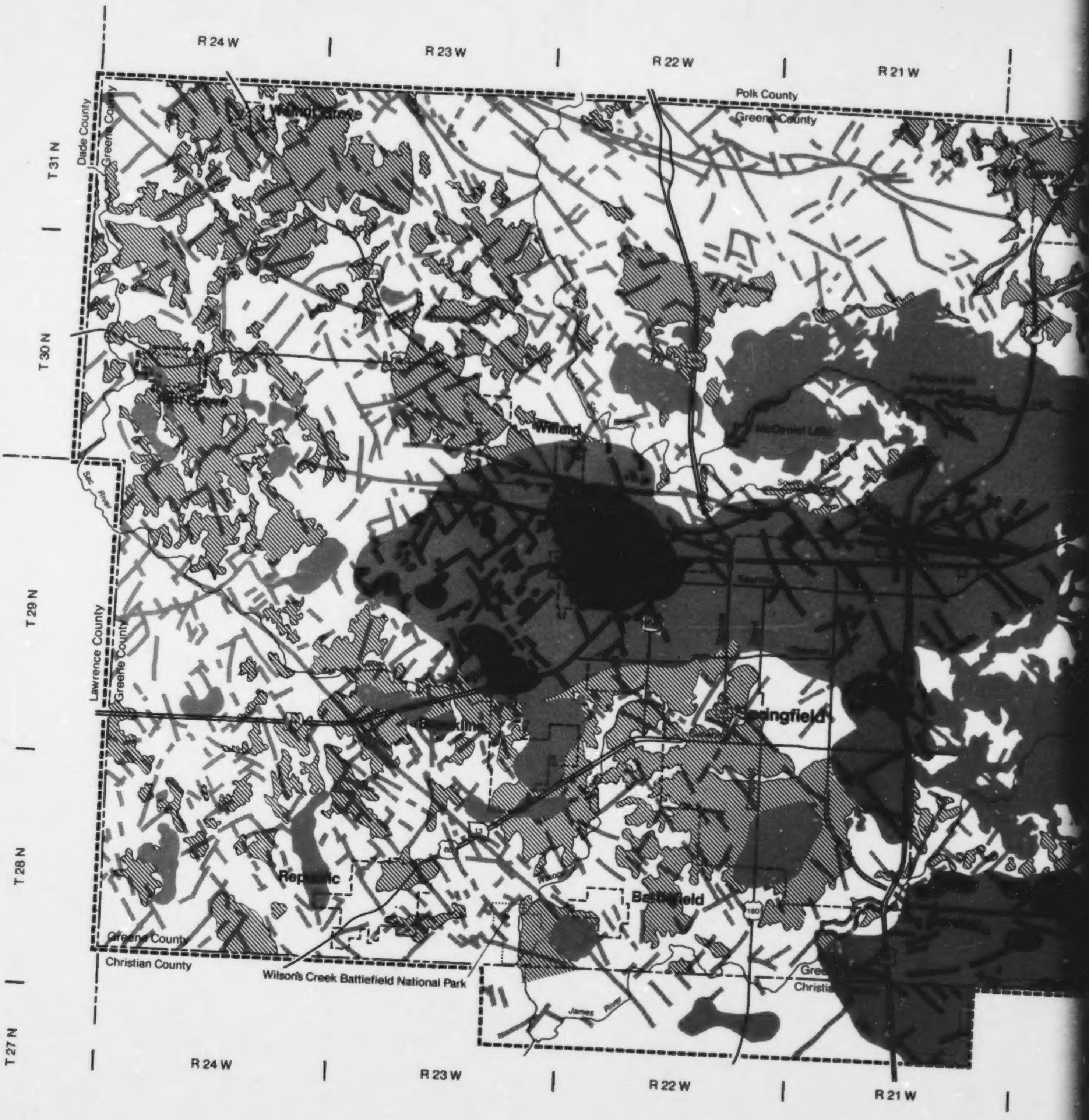
With the exception of the Swan Creek Sandstone, the lower aquifer is relatively pure and is utilized by the largest private, industrial, and city public wells. The upper aquifer can be distinguished chemically from the lower aquifer in nonpolluted areas because of the different rock units that make up the aquifers.

The chemical quality of the county's spring water is similar to that of the shallow aquifer, because of the many interconnections between the springs and the shallow aquifer. The chemical quality of water from the deep aquifer becomes nearly identical to that of the shallow aquifer in urban areas such as Springfield where both are present. Since the shallow aquifer is a source of recharge, and possible contamination, of the lower aquifer, further pollution of the upper aquifer can only increase the likelihood of pollution of the lower aquifer and jeopardize its utility as a source of potable water.

The water quality of Greene County's springs ranges from excellent to severely degraded, and is affected by the quality of the surrounding surface and ground waters, the land use of the area, and the amount of protection given to springs.

Septic tanks are believed to be the most significant source of bacterial pollution of the aquifers in Greene County. Health Department officials relate this to the poor construction and maintenance practices for septic systems and the generally unfavorable subsurface conditions for on-site wastewater treatment systems. However, septic tanks remain the major method of sewage treatment in Greene County outside of Springfield and are of signficance even within the city limits. Approximately 31 percent of the dwellings in Greene County are on septic tanks and about 90 percent of the county outside of Springfield, Ash Grove, and Republic are on septic systems. Many of the systems in the County are believed to be properly operating, but a system may appear to be working when it is actually discharging to the ground water. Older systems in particular are likely to have become clogged and to channel the septic effluent directly into the groundwater via zones of discrete

A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Fellows Lake
Sac River
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Lawrence County
Greene County
Kearney
Springfield
Brookline
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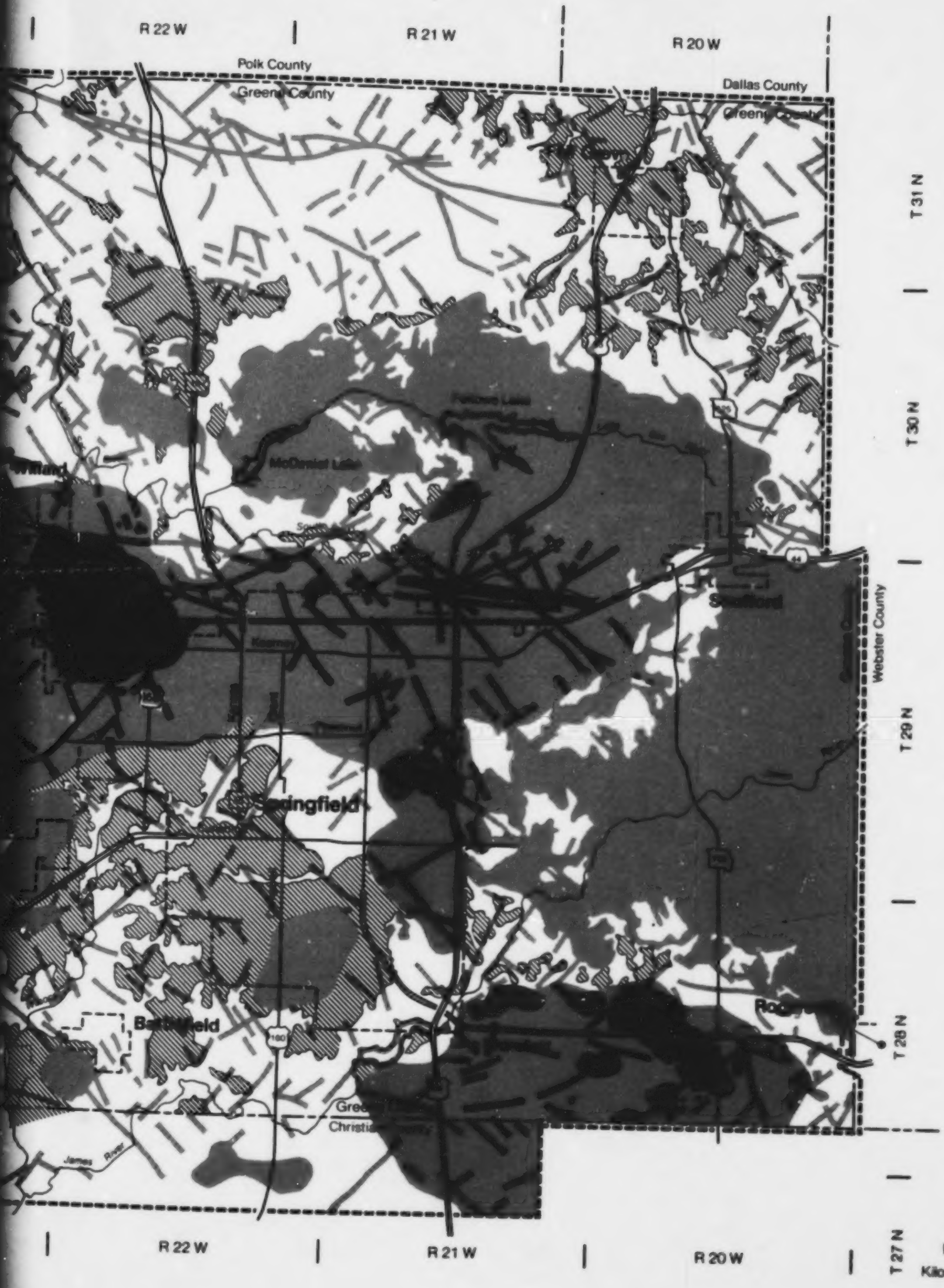
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McDaniel Lake
Fellows Lake
Willard
Strafford
Webster County
Kearney
Springfield
Battlefield
Rogersville
Greene County
Christian County
James River
R 22 W
R 21 W
R 20 W

Groundwater Contamination Hazard Areas

Figure 2

Note:

Christian County information inferred from USGS maps and based on Aley & Thomson, 1980 rating system. Specific data not readily available.

The rated areas on this map have been generalized from several categories. The map should be used with caution, for planning purposes only in the broadest sense. For specific sites, additional study is advised.

Legend

☐ Low Hazard
▨ Moderate Hazard
■ High Hazard
■ Extremely High Hazard

Source: (12)

Planning Area
City Limits
County Limits

Miles 1 2 3 4
Kilometer 1 2 3 4 5 6
North

recharge. Many of the systems near or in the city have insufficient space to operate and are failing. The MDNR has established minimum areas for septic system absorption fields based on soil percolation tests. However, practically any soil will pass a percolation test if tested in the dry season. Also, the percolation test by itself does not indicate whether a septic system will function properly, but only whether the soil will allow water to pass. Septic tanks do not accomplish a high degree of bacterial removal. It has been found that in some soils bacteria can travel as far as 180 feet and in fractured limestone the distance is up to 1500 feet. Missouri has no comprehensive statewide control of septic tank usage. Local authorities cannot regulate existing septic systems, unless a public health menace is found and so declared. Each individual septic tank is only a small producer of pollution and many persons cannot understand that individual systems can cause problems; however, the large number of septic tanks in use in the planning area must be considered.

There are a number of abandoned solid waste landfills in Greene County that were poorly constructed and operated. Not all of the abandoned landfills have been located and few have been monitored for harmful discharges to the surface water or ground water. Two of the City's former landfills, located in the flood plains of the South Dry Sac and Little Sac River, have been shown to leach harmful substances. Many other landfills, particularly those located in flood plains, probably leach pollutants during wet weather.

No inventory of private wells exists in Greene County. Wells that are improperly cased when drilled or improperly sealed when abandoned serve as conduits for pollutants from surface water or from contaminated aquifers to uncontaminated aquifers. This secondary contamination presents a particular danger to Springfield's drinking-water wells, which penetrate the deeper, unpolluted aquifer and have been properly cased against the upper contaminated aquifers. Cases of contamination have been reported in the "Swan Creek sand", the uppermost layer of the deep aquifer. The Missouri Geological Survey is recommend-

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ing that wells for domestic use in the Springfield area be properly cased below the "Swan Creek" which ranges in depth from about 350 to 400 feet.

Protecting the quality of existing and potential water supply sources is extremely important in Greene County. Because the area is situated on a major drainage divide, surface water supplies are limited in quantity and capacity to assimilate pollutants. Ground water resources are also limited and very vulnerable to pollution because of the karst topography with close and complex interconnection of surface and ground water.

Growth and development and related wastewater management in Greene County may impact water supplies in many ways. Both surface and ground water contamination could cause serious problems. Ground water concerns are magnified by the vulnerability of the aquifers in Greene County and the difficulties in detecting or reversing pollution effects. Most ground water supplies in Greene County receive little or no treatment. The larger supplies are protected by properly constructed deep wells, but individual and other private wells are often shallow, inadequately cased and sealed, and not monitored for quality. Increasing development and the soils, geology and other problems causing on-site wastewater treatment systems to malfunction, result in surface and ground water degradation in many areas.

5. Cultural Resources

Substantial numbers of prehistoric and historic archaeological sites have been found in Greene County. Most surveys have been along major rivers and streams, but a few surveys of upland divides and upper reaches of small streams have revealed a significant number of sites, particularly near sinks and springs. Prehistoric Indian artifacts and sites are likely to be found where there is a permanent water source. There are also sites where geological formations include stones used in tool making, and probably upland hunting and burial sites.

6. Population

The City of Springfield, which is ringed by several smaller communities, dominates urban development in the planning area, which is divided into nine subareas (Springfield, Battlefield, Brookline, Fair Grove, Republic, Strafford, Walnut Grove, Willard, and the Unincorporated Low-Growth area) for wastewater facilities planning purposes. The area has grown rapidly with much of the growth in the last ten years occurring to the south and southwest of Springfield. An analysis of the components of population change (births, deaths, and migration) for Greene County and Springfield demonstrates that most of the population growth in Greene County has resulted from net migration (in-migration less out-migration) rather than from natural increase (the number of births minus the number of deaths). Furthermore, the share of the total population change attributed to positive net migration has consistently increased in the last thirty years, suggesting the relative attractiveness of Greene County as a place to live. Springfield, on the other hand, has shown increases in its base population from census to census but these increments have become smaller. The contribution of net migration to population change in Springfield has steadily declined. In the last 10 years, the bulk of the population change in Springfield has been a result of natural increase.

The surrounding subareas of Battlefield, Fair Grove, Republic, Strafford, and Willard are projected to more than double their 1980 population by the year 2005, and the population of the City of Springfield is projected to increase from about 133,000 to over 168,000 (see Table 4). The total population of the planning area is projected to increase from about 188,000 in 1980 to nearly 292,000 in 2005. About 12.5 percent of the land in the study area is developed with the remaining undeveloped land in agricultural use or vacant. Residential and commercial growth will continue to decrease the amount of undeveloped land.

7. Economics and Financing

The planning area has a diverse economic base characterized by a strong wholesale and retail trade sector (27 percent of total non-agricultural employment), manufacturing sector (20 percent), and service sector (23 percent). Most of the employment oppportunities are concentrated in the City of Springfield. Agribusiness, although not a

TABLE 4
POPULATION PROJECTIONS
BY INCORPORATED AREA AND UNINCORPORATED TOWNSHIP AREAS AND FOR THE CHRISTIAN COUNTY PORTION OF THE PLANNING AREA

Entity/Year	1980	1985	1990	1995	2000	2005	2010	2015	2020	2025
Planning Area	187,968	206,338	226,500	248,510	272,520	291,740	312,160	330,700	350,240	369,530
Greene County	185,492	203,100	222,500	243,750	267,000	285,400	305,000	322,750	341,500	360,000
Ash Grove	1,157	1,212	1,265	1,332	1,400	1,468	1,537	1,605	1,673	1,741
Battlefield	1,227	1,625	2,020	2,420	2,816	3,210	3,610	4,000	4,400	4,800
Brookline	211	212	231	254	278	298	317	330	343	356
Fair Grove	863	1,073	1,287	1,501	1,715	1,929	2,143	2,357	2,571	2,785
Republic	4,485	5,575	6,566	7,597	8,627	9,658	10,688	11,717	12,746	13,776
Springfield	133,116	139,900	147,050	154,550	162,400	168,550	174,900	181,500	188,400	195,500
Strafford	1,121	1,430	1,743	2,056	2,369	2,682	2,995	3,308	3,621	3,934
Walnut Grove	504	538	571	604	637	670	703	736	769	802
Willard	1,799	2,244	2,681	3,210	3,739	4,306	4,874	5,427	5,981	6,534
Total Greene Co. Incorporated Area	144,483	153,809	163,414	173,524	183,981	192,771	201,767	210,980	220,504	230,228
Boone Twp.	644	660	688	720	762	776	799	812	829	843
Brookline Twp.	1,057	1,086	1,123	1,165	1,217	1,256	1,291	1,320	1,352	1,386
Campbell Twp.	3,742	5,612	7,770	10,229	13,023	15,215	17,587	19,536	21,615	23,597
Cass Twp.	851	867	903	945	1,000	1,019	1,049	1,065	1,087	1,106
Center Twp.	3,548	3,652	3,814	4,001	4,238	4,342	4,488	4,579	4,690	4,795
Clay Twp.	2,341	2,828	3,389	4,024	4,750	5,316	5,937	6,434	6,977	7,489
Franklin Twp.	3,374	3,541	3,760	4,002	4,295	4,472	4,686	4,851	5,035	5,213
Jackson Twp.	2,627	2,745	2,905	3,081	3,299	3,425	3,583	3,699	3,833	3,959
Murray Twp.	957	977	1,017	1,066	1,128	1,148	1,182	1,200	1,226	1,247
North Campbell Twp.	4,106	6,916	10,179	13,877	18,078	21,374	24,953	27,877	31,008	33,996
Pond Creek Twp.	713	729	759	795	842	857	883	896	915	931
Republic Twp.	1,151	1,169	1,218	1,275	1,350	1,374	1,416	1,437	1,467	1,493
Robberson Twp.	3,445	3,524	3,632	3,763	3,920	4,003	4,107	4,179	4,263	4,346
Taylor Twp.	1,799	1,848	1,912	1,986	2,076	2,127	2,190	2,234	2,286	2,337
Walnut Grove Twp.	683	701	731	765	810	825	849	862	880	896
Washington Twp.	1,819	1,878	1,952	2,030	2,129	2,190	2,262	2,318	2,378	2,438
Wilson Twp.	8,152	10,558	13,334	16,502	20,102	22,910	25,971	28,471	31,155	33,700
Total Uninc. Area	41,009	49,291	59,086	70,226	83,019	92,629	103,233	111,770	120,996	129,772
Christian County	2,476	3,238	4,000	4,760	5,520	6,340	7,160	7,950	8,740	9,530

major employer, is nevertheless an important economic activity and is a principal contributor to employment in the transportation sector and in the feed milling industry.

Manufacturing has traditionally been the major employer in the area, although its share of employment has decreased in recent years. This relative decrease in manufacturing employment has been offset by absolute and relative employment gains in the wholesale/ retail trade sector and in the service sector. Government employment (civilians only) is an important job source in the planning area, but weighs less heavily in the area than it does in the state. Employment in the transportation/communications field and in the finance, insurance, and real estate sector has been fairly constant since 1972, a trend very similar to state-wide employment for these activities. Unemployment rates in the planning area have been low, relative to the national average.

The alternative methods for financing wastewater facilities available to the various governmental or administrative units within the planning area include general obligation bonds, revenue bonds, special assessments, and tax bills. The authority to issue bonds for wastewater facilities is available to the Greene County Sewer District, Greene County, and the incorporated cities, towns, and villages in the planning area. In general, cities may incur a total debt equal to 20 percent of their assessed valuation (not considering an additional 10 percent available for industrial general obligation bonds).

Two principal types of municipal bonds are used to finance major local government expenditures--general obligation bonds and revenue bonds. General obligation bonds are secured by the taxing power of the local government. They have traditionally been considered the more secure of the two types because local governments can levy taxes to meet the debt service (principal and interest) on the bonds. General obligation bonds require voter approval by a two-thirds majority before they can be issued. An important feature of these bonds is that the cost of repayment (debt service) is shared by all residents, which is acceptable when the financed project benefits the community as a whole, such as a municipal wastewater treatment plant.

When it is desired to have only the users of a facility pay for its financing and not the entire citizenry, revenue bond financing is used. Revenue bonds are repaid from revenues generated through use of the facility, usually from user fees or service charges, and require voter approval by a simple majority. They are often used for projects, such as a treatment facility serving a new industry, where it would be inequitable to distribute the cost to the entire community. Revenue bonds have become more popular than general obligation bonds in recent years, probably due to an increase in the types and specificity of services provided by local government and the frequent difficulty in gaining the greater voter approval for general obligation bonds. Also, there are no interest rate limitations associated with revenue bonds, and future rate or fee increases do not require voter approval.

Tax bills function very much like general obligation bonds (except that the general public does not vote on them). The tax bill is essentially a promissory note, issued by authority of the county court to a private contractor, promising payment of principal and interest in annual, equal installments over a period of two to ten years. The funds to pay the construction portion of the debt are secured by apportioning the total cost including interest (previously limited to six percent per year) among affected property owners in the sewer district. Property already serviced by lateral sewers in the sewer district is exempt from new tax bill assessments for construction of sewers except submain or main sewers. While the law does not specifically mention treatment facilities, it is assumed that the tax bill also reflects this cost.

In addition to tax bill assessments for construction of the facilities, the maintenance and repair costs of the project are paid by a special assessment on the assessed value of real estate within the sewer district. All property owners within the sewer district are subject to this assessment. Finally, a user charge based on the amount of water supplied to the premises is normally billed to users of the sewerage system.

One of the major issues in Greene County is the manner in which construction-related tax bills should be allocated among property owners. Since previous state law required calculating the tax on the basis of the area of the property, property owners with large tracts would have to pay a proportionately larger bill than owners of lesser acreage without regard to the use or developability of the land.

In 1983, House Bill 371 was passed by the Missouri legislature and provides for apportioning the tax bills either by square footage or by the linear feet of sewer line running along or through the property for each lot, tract, or parcel of ground in the sewer district. Moreover, no assessment is made against property owners for land that is not platted unless the property owner petitions for sewer service. The bill also allows the tax bills to bear the current interest rate as approved by the county court. Changing the acreage basis by which tax bills are calculated results in a more equitable distribution of costs. Removing the six percent limitation makes the tax bills a more attractive investment instrument.

8. Community Services

Community services (police and fire protection, schools, parks, hospitals, etc.) and transportation are generally adequate to serve the needs of the area. The City of Springfield depends primarily on surface water, supplemented with ground water, for its water supply. The surrounding communities and rural residents rely on ground water supplies. Securing future water supply sources and protecting existing sources to meet the needs of the mid-1990's and beyond is a very important concern of the City of Springfield.

9. Land Use

There are approximately 57,000 developed acres in the planning area accounting for just over 12 percent of the total land area. Development is concentrated around Springfield with over 44,000 developed acres (78 percent) located in the Springfield vicinity.

Most of this developed area is residential. Nearly all development in southern Springfield and to the south and east of Springfield is residential. Commercial uses are located along major arterial streets and industrial development is distributed along major highway and rail routes.

Much of the development outside of the Springfield vicinity is residential. It is fairly scattered, with the number of subdivisions decreasing as the distance from Springfield increases. In addition, scattered industrial and commercial uses occur on a very small scale.

Even though most of the planning area's developed land is in the immediate Springfield vicinity, nearly 70 percent of the total land in that vicinity remains undeveloped. There is thus considerable vacant or agricultural land for future development within or near Springfield.

Over half of the land in the planning area, or 246,000 out of 452,000 total acres, is devoted to agricultural uses. The primary agricultural activity, both in terms of acres and total value, is livestock raising. Because the soils in the planning area are relatively poor in comparison to the soils in northern Missouri, cultivation of grain crops is less important.

Agricultural lands are obviously valuable for food production. Such lands are also environmentally important because they reduce runoff and replenish ground water supplies by absorbing precipitation and because they provide buffer zones between environmentally sensitive areas and urban development.

Greene County and the City of Springfield both have comprehensive plans, zoning regulations, and subdivision regulations. Of relevance to this EIS is the Greene County Planning Commission's goal to provide the county with alternatives to or improved management and control of traditional septic tank treatment of sewage.

Planned residential zoning in unincorporated parts of Greene County is to be restricted to an area within several miles of the Springfield city limits. Commercial zoning would be along major highways, and generally within the confines of residentially zoned areas; the only exceptions would be a strip along Missouri Highway 13 between Brookline and Republic and two interchanges along I-44 west of Springfield. Industrial zoning in the county would be limited to areas adjacent to the City of Springfield's industrially zoned areas, the major ones being along I-44 east and west of Springfield. The balance of the county would be zoned as an agricultural district. The concept of clustering future development around Springfield, through zoning, is based upon trunk sewers (and other services and utilities) being available in the areas adjacent to Springfield and development being guided to these areas.

B. WASTEWATER TREATMENT PROBLEMS

There are three major municipal wastewater treatment plants in the planning area, serving mainly the incorporated areas of Springfield and Republic (see Summary Figure). A number of subdivisions, mobile home parks, and other developments have their own treatment systems, mainly lagoons and small treatment plants. The remaining population is served by on-site treatment facilities, mostly septic tank systems.

The existing Springfield Northwest Plant and the Republic plant have frequently failed to meet required effluent limitations. Renewal of the expired discharge permits for both plants has been denied because of the serious deficiencies. The Republic and Northwest plants are both overloaded and frequently do not meet secondary treatment effluent standards, much less the more stringent losing stream standards which apply to each. The lagoons used for part of the treatment at Republic represent a significant threat to ground and surface water quality from potential catastrophic collapse associated with sinkholes in the area. Springfield's Southwest Plant provides a high degree of treatment and generally meets effluent limitations. Excessive infiltration and inflow are serious problems for the Republic and Springfield systems, overloading collection and treatment facilities during wet weather.

The Northwest Treatment Plant serves the part of Springfield lying north of the Burlington Northern (formerly the St. Louis-San Francisco) railway tracks. The Southwest Treatment Plant serves the rest of the city, which includes about 85 percent of Springfield's population and land area. Both plants also serve some areas outside the city limits. Although sanitary sewer service is provided to nearly all parts of the city, only about 85 percent of the population is actually connected to either system. The other 15 percent uses on-site systems or small package plants. Springfield's sanitary sewer system dates back to 1894 and the collection systems for both treatment plants contain some very old sections, with some pipe over 80 years old. The sewer system is maintained by the Public Works Department, which routinely cleans it about once every two years. The sanitary system is not designed to handle storm drainage. Efforts have been made to locate and eliminate sources of extraneous flows in the most troublesome areas. However, the sewer system still has a large amount of infiltration/inflow (I/I), increasing the amount of wastewater the system must convey to the treatment plants. During wet weather, the wastewater flow exceeds the capacity of some pipes resulting in overflowing manholes and basement flooding. Causes of the excess I/I include deterioration of old pipe joint materials, faulty construction, illegal connection of roof and foundation drains, manhole deterioration, and damage from abuse.

Many of the small treatment systems are overloaded and poorly operated and maintained. These conditions limit the treatment effectiveness and often result in violations of effluent limitations.

The remainder of Greene County - that portion of the population not served by municipal or private treatment facilities - uses on-site treatment systems for wastewater disposal. The most common type of on-site system is the conventional septic system, consisting of a septic tank and an adjacent absorption field. Other types of on-site treatment found in Greene County are aerated septic tanks with absorption fields, and a septic tank with an elevated absorption field (a mound system), located in Strafford.

A properly operating septic system provides very adequate treatment of the wastewater from a single home or a group of homes. Solids accumulate in the bottom of the septic tank, where the sludge is partially stabilized by bacteria. Grease and other light particles float to the top of the tank and are trapped. The remaining liquid flows from the tank to the absorption field and into the surrounding soil through perforated pipes. As the wastewater flows downward, it is purified by bacterial activity and reactions with the soil. There have been many problems with septic systems in Greene County. Surfacing sewage and infiltration of the groundwater by partially treated effluent from septic systems are common occurrences in some areas. These problems can be traced to several factors: poor design and construction, irregular maintenance, and poor soil suitability.

Current design and construction practices in Greene County often lead to malfunctioning septic systems. For example, improper laying of the pipe results in uneven distribution of the tank effluent to the absorption field. Inadequate area for the absorption field is another problem, leading to premature clogging of the field after a short operating period.

Septic tanks should be pumped out on a regular basis to prevent solids overflow and clogging of the absorption field. However, there are no requirements in Greene County for regularly scheduled maintenance of septic systems. General practice is to pump out septic tanks only when the homeowner has problems with surfacing sewage or when wastewater backs up into the house. By that time, the absorption field has been damaged and pumping out the septic tank provides only limited relief. Pumped septage is disposed of at the Northwest Treatment Plant in Springfield or on nearby farmland.

C. FACILITIES PLAN ALTERNATIVES AND RECOMMENDATIONS

Specific alternatives for each of the subareas were developed and evaluated as discussed in the draft and final Wastewater Facilities Plan for Greene County Sewer District. This section briefly describes these alternatives, including regionalized alternatives, and indicates the specific alternative recommended on the basis of engineering criteria and costs. New information and changes since the draft Facilities Plan and Draft EIS are given. Capital and annual costs of alternatives are presented.

For each subarea, a "no action" alternative and alternatives for new or modified wastewater collection and treatment systems were developed. The feasibility and costs of cluster systems and gravity, pressure, and vacuum sewer collection systems were assessed for unsewered areas, and treatment plant processes, alternative discharge points, and land treatment were evaluated. New collection facilities and improved wastewater treatment and management were considered for existing systems.

For the unsewered communities, it is unlikely that any central collection and treatment system could be financed without federal and state funding assistance. No action alternatives for these communities mean continued use of existing septic tank and small treatment systems, and installation of new ones. The communities and Greene County may control and manage on-site systems to varying degrees, but soil and geological conditions preclude the longer term acceptability of on-site systems in many areas.

Cluster disposal systems using absorption field and mound system variations were evaluated for unsewered areas. These were not found to be cost-effective because of soil limitations for absorption systems and high costs for mound systems.

Combination collection systems using gravity sewers, pressure sewers with septic tank effluent pumping, and on-site disposal systems in particular areas were generally found to be most cost-effective for the unsewered communities. Vacuum collection systems and pressure collection systems using grinder pumps were not cost-effective.

Land application was not found to be cost-effective because of soils that greatly limit allowable application rates and large storage basin requirements. Costs include land purchase for lagoon and storage basin areas, but application would be on private land. Negotiation of long-term agreements for the use of the private land could also pose problems.

The proposed improvements and other leading alternatives for each subarea are discussed in the following sections and shown on the Summary Figure and Figure 3.

1. Springfield Subarea

The Springfield subarea* includes the area served by Springfield's existing collection system, existing or planned trunk

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*The Springfield subarea as delineated by the MDNR includes the cities of Springfield, Strafford, Brookline, and Battlefield and a large unincorporated area surrounding Springfield. Strafford, Brookline, and Battlefield are addressed as individual subareas for facilities planning purposes, with alternatives that include possible regionalization.

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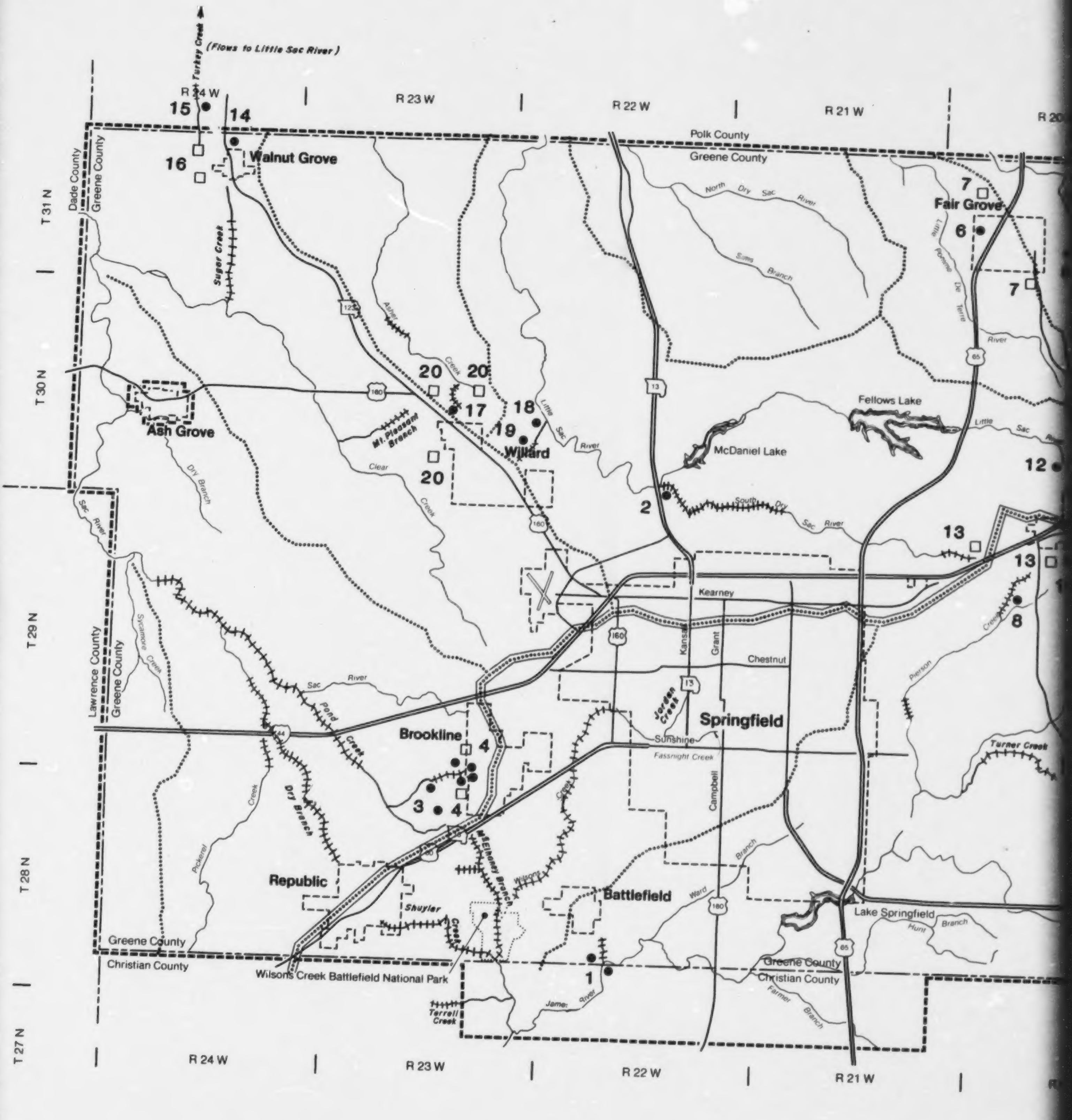

Turkey Creek
(Flows to Little Sac River)
R 24 W
R 23 W
R 22 W
R 21 W
R 20
15
14
16
Walnut Grove
Polk County
Greene County
Dade County
Greene County
T 31 N
T 30 N
T 29 N
T 28 N
T 27 N
North Dry Sac River
Sims Branch
7
Fair Grove
6
7
Little Pomme De Terre River
Sugar Creek
123
Asher Creek
20
20
17
18
19
Willard
20
Little Sac River
160
Ash Grove
Mt. Pleasant Branch
Clear Creek
Dry Branch
Sac River
13
Fellows Lake
Little Sac
McDaniel Lake
12
2
South Dry Sac River
13
13
Kearney
8
Creek
Kansas
Grant
Chestnut
Lawrence County
Greene County
Sycamore Creek
Sac River
Pond Creek
Jordan Creek
Springfield
Pierson
44
Brookline
4
Sunshine
Fassnight Creek
Turner Creek
3
4
Creek
Dry Branch
Campbell
McElhaney Branch
Pickerel
Republic
Wilsons
Battlefield
Ward Branch
Shuyler Creek
180
Lake Springfield
Hunt Branch
65
Greene County
Christian County
1
Greene County
Christian County
Wilsons Creek Battlefield National Park
James River
Farmer Branch
Terrell Creek
R 24 W
R 23 W
R 22 W
R 21 W

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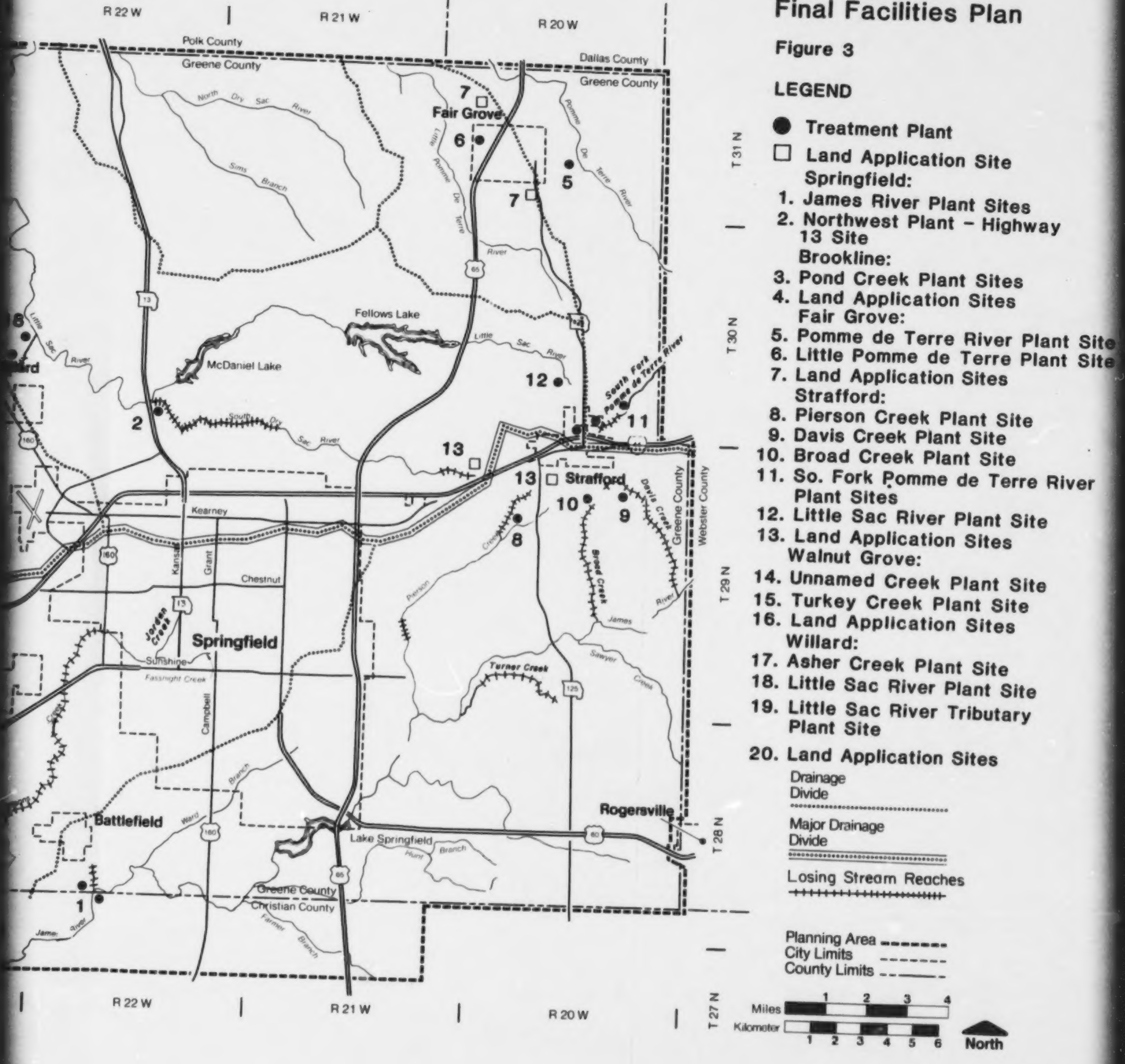
Project Alternatives Not Proposed In Final Facilities Plan

Figure 3


LEGEND
● Treatment Plant
☐ Land Application Site
Springfield:
1. James River Plant Sites
2. Northwest Plant - Highway 13 Site
Brookline:
3. Pond Creek Plant Sites
4. Land Application Sites
Fair Grove:
5. Pomme de Terre River Plant Site
6. Little Pomme de Terre Plant Site
7. Land Application Sites
Strafford:
8. Pierson Creek Plant Site
9. Davis Creek Plant Site
10. Broad Creek Plant Site
11. So. Fork Pomme de Terre River Plant Sites
12. Little Sac River Plant Site
13. Land Application Sites
Walnut Grove:
14. Unnamed Creek Plant Site
15. Turkey Creek Plant Site
16. Land Application Sites
Willard:
17. Asher Creek Plant Site
18. Little Sac River Plant Site
19. Little Sac River Tributary Plant Site
20. Land Application Sites
Drainage Divide
Major Drainage Divide
Losing Stream Reaches
Planning Area
City Limits
County Limits
Miles 1 2 3 4
Kilometer 1 2 3 4 5 6
North
R 22 W
R 21 W
R 20 W
T 31 N
T 30 N
T 29 N
T 28 N
T 27 N
Polk County
Greene County
Dallas County
Webster County
Christian County
North Dry Sac River
Sims Branch
Little Pomme De Terre River
Pomme De Terre River
South Fork Pomme de Terre River
Fellows Lake
McDaniel Lake
Little Sac River
South Dry Sac River
Fair Grove
Strafford
Davis Creek
Broad Creek
Pierson Creek
James River
Sawyer Creek
Turner Creek
Kearney
Chestnut
Kansas
Grant
Campbell
Jordan Creek
Springfield
Sunshine
Fassnight Creek
Ward Branch
Battlefield
Rogersville
Lake Springfield
Hunt Branch
Farmer Branch
James River
rd
65
13
160
125
60
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sewer drainage basins, and other significantly developed areas surrounding Springfield. Wastewater in the Springfield subarea is presently handled by: 1) collection and treatment by the City of Springfield system, 2) private systems serving subdivisions, trailer parks, shopping centers, and schools, and 3) individual on-site systems. Approximate numbers of persons currently served by these methods are:

Springfield Municipal System	115,000
Private Facilities	5,000
On-Site Systems (Septic Tanks)	40,000

The Springfield Municipal system serves some unincorporated growth areas adjacent to it in addition to the City itself. The Springfield subarea is separated by a major drainage divide into northern and southern portions, served by the Northwest and Southwest treatment plants, respectively (see Summary Figure).

For wastewater facilities planning, population projections were disaggregated according to major system components and drainage areas. Projections of industrial, commercial, and institutional expansion and locations were also made. Future flow and wastewater loadings were then projected and broken down by segments: 1) domestic, 2) industrial, 3) institutional, 4) commercial, and 5) allowable infiltration/inflow. The effects of future flows and waste loads on system facilities and areas were analyzed.

A summary of the additional population projected for the Springfield subarea plus existing population not served is as follows:

City of Springfield	
Existing Population Not Served	19,400
Additional Population by Year 2005	35,400
Additional Population to be Served	54,800

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Unincorporated Area

Existing Population Not Served	16,540
Additional Population by Year 2005	39,200
Additional Population to be Served	55,740

The major new facilities proposed for the Springfield subarea include: the Pierson Creek and Thompson Branch interceptors of the southern system; and the new Northwest treatment plant and Little Sac and South Dry Sac interceptors of the northern system (see Summary Figure).

a. Southern System. The southern portion of the Springfield Municipal system handles about 85 percent of all residential customers served in the city, plus most of the industrial and commercial areas.

The Southwest Plant interceptor and newly constructed Wilson Creek interceptor are the two major gravity sewers that discharge directly into the Southwest Plant. Several major interceptor and trunk sewers are tributary to the Southwest Plant interceptor.

The James River interceptor and pump station system serves or potentially serves large portions of the southern and eastern parts of the Springfield subarea. These areas have grown significantly since the early 1970's and are projected to continue to grow at a greater rate than other parts of the subarea.

Infiltration and inflow (I/I) to the Southwest Plant are excessive during periods of rainfall. Flows of up to 75 MGD exceed the 42-MGD hydraulic capacity and supplemental holding capacity of the plant. Infiltration and inflow for 7- and 14-day high flow periods were calculated to be 8600 and 7600 gallons/inch diameter/mile/day. Problems of surcharging trunk and interceptor sewers are also caused by excess I/I.

Needs and alternatives to handle future wasteloads were evaluated for the southern system. Collection and treatment alternatives and short range and long range improvements were considered. Areas of concern include I/I, treatment plant hydraulic and process capacities, sludge disposal, trunk and interceptor sewers, and possible effluent reuse.

1) Southern System Treatment. A summary of current and projected flow, BOD, and SS loadings to the Southwest Treatment Plant system and comparative design capacities of the existing plant are given in Table 5. Even during dry weather the current flow of 17.0 MGD includes over 3.5 MGD I/I. The year 2005 projected loadings are shown with James River pump station flows (case 1) and without (case 2). Alternatives for the Southwest Plant system consist of expansion and improvements with and without a new treatment plant for the James River system, the possibilities of effluent reuse or land application, and potential regionalization that might serve the Battlefield, Brookline, Republic and Strafford subareas. The regionalization alternatives are described in the sections on alternatives for each of these specific subareas.

a) Plant Improvements and Expansion. The primary treatment influent channels, grit removal system and primary clarifiers can handle peak flows of 42 MGD compared to a current average day peak flow of nearly 39 MGD. Whether or not the James River system remains tributary to the Southwest Plant, hydraulic expansion of these facilities will be needed before 2005.

Calculations indicate the oxygenation system can hydraulically handle flows 50 percent over current design and can handle BOD loadings as well as flow for the year 2005.

Studies of settling velocities and overflow rates find that clarifier capacity is limited to the design peak flow of 42 MGD. When mixed liquor suspended solids in the oxygenation system are high, capacity is sometimes more limited. If the James River system flows to the Southwest Plant continue after 1992, construction of additional clarifiers will be necessary. If not, the existing units will be satisfactory until 2005.

TABLE 5
SPRINGFIELD SOUTHERN SYSTEM
CURRENT AND PROJECTED WASTE LOADINGS

Parameter	Existing Plant Design	Current	Projected-2005* Case 1	Projected-2005* Case 2
Flow (MGD)				
- Average Day	30	25.4	35.7	30.3
- Peak Hydraulic	45	--	--	--
- Dry Weather	--	17.0	26.8	21.7
- Peak Day	--	74.7	86.2	79.9
- Peak Rate	--	100	115	109
- Peak Flow on Average Day	--	38.7	53.7	46.0
BOD (lb/day)				
- Average Day	92,600	44,400	80,655	68,755
Susp. Solids (lb/day)				
- Average Day	50,000	35,300	63,200	49,625

*Case 1 includes the James River pump station flows while Case 2 does not.

The nitrification system consists of the aeration tanks and clarifiers of the original plant and three added clarifiers. This portion of the plant has less reserve capacity than many others, and is limited hydraulically to 42 MGD peak flow, or less if conditions are not favorable for nitrification. If James River system flows remain tributary after 1992, expansion of these facilities will be required.

At a flow of 42 MGD the eight multi-media gravity filters are loaded at 4.2 gpm/sq. ft. These units should handle peak flows of at least 60 MGD (6.0 gpm/sq. ft.) and should thus be adequate to the year 2005 with or without James River system flows.

Ozone is applied at three parallel covered tanks with a flow capacity of 75 MGD. The system performs well except for equipment failures and during periods of excessive I/I when settled overflow is mixed with final effluent.

When plant influent flow rate is greater than 42 MGD, wastewater is routed to a 4.4-MG settling pond which overflows to two holding ponds of 7.4 and 29.4 MG capacity, respectively. Retained flows are pumped back to the treatment plant when influent flow drops below 42 MGD. If the ponds are full, overflows are disinfected at the ozonation tanks and discharged. For the 1979 to mid 1982 periods, overflow quantities averaged 246 MG/year. Unless controlled, quantities of I/I and resultant overflows can be expected to increase with new sewer construction and existing collection system deterioration.

The sources of sludge at the Southwest Plant are primary clarifier sludge and waste activated sludges from the oxygenation and nitrification systems. Solids in the effluent filtration system backwash, flotation thickener subnatant*, and vacuum filter filtrate are returned to the primary clarifiers. Primary sludge and thickened waste activated sludge are anaerobically digested and applied to farmland as liquid or dewatered cake.

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*Subnatant is the relatively clear water below the concentrated, floating sludge.

The six existing air flotation thickeners for waste activated sludge were loaded at 9.4 lb/sq ft/day during 1981 compared to a maximum design loading of 44 lb/sq ft/day. Average loadings in the year 2005 would be 16 lb/sq ft/day and the existing thickeners are therefore more than adequate.

The existing sludge treatment process is well designed, reliable, and energy efficient. The anaerobic digestion process is satisfactory with good gas production and volatile suspended solids (VSS) reduction. Odor problems from land spreading of the sludge are caused by the relatively high VSS content of the treated sludge and the application rates necessary on the available land. Digester gases are used to fuel a diesel-driven air blower for nitrification, boilers that heat the digesters, and boilers that heat the blower building and office. Analysis showed that additional anaerobic digestion would not significantly reduce the potential odor problems from land spreading of the sludge.

In 1981, about 40% of the sludge was spread as a liquid and the rest as dewatered sludge cake with about 12 percent solids. The existing coil-type vacuum filters have a design solids loading of 59,700 lbs/day which is greater than the 2005 projected total of 44,600 lbs/day. While the vacuum filters have adequate capacity to handle future sludge quantities, chemical conditioning costs and limited sludge cake dryness are drawbacks.

Since 1960, sludge has been spread on about 1320 acres of area farmland and City owned land. Sludge is hauled to private land on request from the owner. Nearly all suitable soils within a five mile radius of the plant are now being used for sludge disposal. Potential problems will increase in the future with greater quantities and higher VSS content of digested sludge, reduced pathogenic organism kill with less digester detention time, and a reduced land availability from suburban development.

In order to control odors and assure pathogen kills, methods for further stabilizing the sludge were reviewed. The conventional methods available are lime stabilization, aerobic digestion, thermal conditioning, or composting. A new method, "oxyozosynthesis," also has some promise.

Lime stabilization is currently practiced when lime is added to help produce vacuum filter sludge cake. This controls odors temporarily, but after land spreading, odor problems develop since the sludges are generally not plowed into the ground. Providing an additional one to two weeks storage at high pH may improve lime stabilization effectiveness.

Oxyozosynthesis involves the application of oxygen and ozone at pH 5 and 60 psi pressure for 1½ to 2 hours. Reportedly, the sludge could then be thickened and dewatered to produce an odorless, bacteria-free cake. Since the Southwest Plant has a supply of oxygen and ozone plus flotation thickeners and vacuum filters for dewatering, the oxyozone reaction chamber and related equipment may be the only new equipment needed.

The use of aerobic digestion, composting, or thermal conditioning would require major changes and expenditures and would only be considered if further lime stabilization or oxyozosynthesis is not feasible or effective. The addition of further VSS reduction and sludge stabilization for land spreading appears more practical and less costly than a major change in disposal method such as landfilling or incineration. Alternate disposal methods should be considered and evaluated with overall solid waste handling and disposal. Further evaluation should be conducted in the next few years as Springfield's sanitary landfill is nearing capacity. For the short range, pilot or plant studies on oxyozosynthesis and lime stabilization should be conducted.

b) Effluent Reuse. The potential for reuse of treated effluent from the Southwest Treatment Plant exists with future expansion to City Utilities Southwest Power Plant, about 1/4 mile away. Power supply studies in 1979 and 1981 addressed the possibility of using effluent for cooling water on future generating units. Further treatment methods, including phosphate and nitrate removal, are discussed. Consideration should be given to the use of treated effluent when the decision to construct a new generating unit is made.

c) Short Range Needs. Needs within the next five years for the southern system include:

- Pilot studies of further sludge stabilization prior to land spreading.
- Incorporation of sludge treatment and disposal studies into overall solid waste management planning.
- A sewer system evaluation survey to locate areas of excessive I/I and determine the cost-effectiveness of removal or storage and treatment.

Preliminary cost estimates for these evaluations are $50,000 for the sludge pilot studies, $30,000 for sludge studies as part of solid wastes management, and $2,500,000 for the sewer system evaluation study.

d) Long Range Needs. Needs within the next five to ten years involve major decisions and significant improvements or additions if wasteloads increase as projected. The principal decision will be whether to expand the Southwest Plant to handle all southern system flow or to construct a new plant on the James River for treating James River system wastes. The exact needs and better cost comparisons can be determined nearer the time hydraulic capacities are reached but preliminary comparative total annual costs are $1,224,000 for expansion of the Southwest Plant and James River pump station system and $1,511,000 for construction of a new James River basin treatment plant.

The effluent criteria for discharge to the James River are assumed to be the same as for the Southwest Plant. Costs are based on a single stage oxygenation and nitrification process. The existing James River pump station would be used to pump to the new plant, located about one mile away.

2) Interceptor and Trunk Sewers. Land developability studies in conjunction with the population projections for the Springfield subarea showed that significant growth can be expected in parts of the unincorporated area tributary to Springfield's southern system. These areas are tributary to the James River interceptor, Ward Branch

trunk sewer, Wilson Creek interceptor, and planned Pierson Creek interceptor. Since most of the major trunk and interceptor sewer network is in place and designed as a gravity system, planning for new sewer needs is also based upon conventional gravity sewers. Sewers are sized for the year 2025 population projections rather than 2005 to minimize future environmental problems and costs associated with sewer construction in areas of karst geology, springs, losing streams, and shallow bedrock.

Sewers are considered only where existing development warrants, since much of the area is now sparsely populated. Specific needs for each major basin are categorized as short range (1 to 5 years), and long range (5 to 10 years). Sewers shown as short range needs will eliminate existing treatment facilities and pump stations or serve developed areas with existing "dead" sewers. Sewers shown as long range needs will serve existing unsewered developments.

a) Pierson Creek Basin. Tributary to the planned Pierson Creek interceptor are about 3,850 acres of unincorporated land in which significant growth is projected. There are also several large developments within the Springfield city limits, east of Highway 65. There are currently about 8,000 persons in Springfield and unincorporated areas in the basin, and average existing flow is estimated at 0.357 MGD. Projected average flow is 1.445 MGD in 2005 and 2.207 MGD in 2025.

Short range needs include a 1,000 ft extension of the currently planned Pierson Creek interceptor plus three collection lines to eliminate treatment facilities serving a subdivision and trailer park, and provide service for several subdivisions, some with existing dead sewers. The total costs for these projects are estimated at $2,511,000.

Long range needs include further extension of the Pierson Creek interceptor to just north of Cherry Street and construction of several additional lines which would serve unsewered subdivisions and eliminate an existing country club treatment facility. Costs of these projects are estimated to total $1,366,940.

b) James River Basin. The James River interceptor went into operation in early 1981 and will serve some areas projected to develop rapidly over the planning period. In addition to receiving flow from the planned Pierson Creek interceptor and Thompson Branch trunk sewer, there are projected growth areas directly tributary to the James River interceptor. Projected average and peak flows to the James River interceptors are 4.092 and 9.41 MGD in 2005 and 5.988 and 12.87 MGD in 2025, plus possible peak flows from the Half-a-Hill area of 6.32 and 6.50 MGD, respectively. The interceptor design capacity of 32 MGD is thus adequate to handle the 2025 flows.

Short range needs include the Thompson Branch trunk and pump station, serving an area immediately north of Lake Springfield, and two collection lines directly tributary to James River interceptor. The Thompson Branch trunk would eliminate the Lakewood Wastewater Treatment Plant and the two pump stations. The collection lines would serve several subdivisions, one with dead sewers, and eliminate a treatment facility serving a mobile home park and subdivision. Estimated costs of the Thompson Branch trunk and the two lines are $809,800 and $524,150, respectively.

Long range needs include a line to serve existing unsewered residential developments. The estimated cost is $302,500.

c) Ward Branch Basin. The Ward Branch trunk went into operation in mid-1980 and serves a rapidly growing area within and outside the Springfield city limits. The Kickapoo High School and Arrowhead pump stations and the Parkcrest treatment facility have been eliminated with connection to this trunk. There are plans to eliminate the McAllister, Sheraton, and Southvale pump stations in the near future. Average and peak flows are currently 0.1 and 0.2 MGD, and projected to increase to 2.507 and 6.27 MGD in 2005 and 3.676 and 8.64 MGD, respectively, in 2025.

Short range needs include the construction of three lines to eliminate the treatment facility for Cherokee School, a pump station, and serve several existing residential developments, some with dead sewers. Estimated costs are $1,504,950.

Long range needs include a line to serve developing residential areas east of Cherokee School, and also some areas within the City of Springfield. The estimated cost is $416,500.

d) Wilsons Creek Basin. The Wilsons Creek interceptor went into service in the late 1970's. It connects to the Upper Wilsons Creek trunk and discharges by gravity into the Southwest Plant. Only minor development exists in the unincorporated areas which are tributary to this interceptor and the only flows now carried are excess I/I overflows from the upper Wilsons Creek trunk. Average and peak flows are projected at 1.26 and 3.4 MGD in 2005 plus 6.0 MGD peak overflow from the upper Wilsons Creek trunk; and 2.28 and 5.59 MGD in 2025 plus 6.50 MGD peak overflow from the upper Wilsons Creek trunk. This is within the 12.5 MGD design capacity, if I/I does not become worse.

Short range needs include a line planned to serve a mobile home park which would eliminate a lagoon. Other needs are downstream of the Southwest Plant and not tributary to the Wilsons Creek interceptor. A line in this area would serve a shopping center and residential developments, and eliminate two pump stations and a small treatment facility. A major pump station would be near Roundtree Spring to pump flows to the Southwest Plant interceptor. The estimated costs are $1,265,650.

There are no identifiable long range needs although significant growth is projected in some areas. Sewers are likely to be installed with this growth in view of current zoning regulations.

e) Summary. Most of the previously discussed short and long term needs will likely be constructed with local financing through the intergovernmental agreement between the City of Springfield and Greene County. The City intends to pursue EPA construction grants for some major projects including the Thompson Branch trunk sewer, pump station, and force main and the Pierson Creek interceptor and extensions.

b. Northern System. The northern portion of the Springfield system handles about 15 percent of all residential customers served in the city, plus a few industries and large motels. The Pea Ridge Creek Trunk and the new Airport trunk and pump station are the major conveyance facilities to the Northwest Plant. The force main from the Airport pump station discharges into the Pea Ridge trunk near the plant.

Flow to the Northwest Plant currently averages about 3.5 MGD, equal to the plant design capacity. Peak day flow is 7.5 MGD while average dry weather flow is about 2.4 MGD. Added treatment capability and capacity and handling excessive I/I are critical needs of the northern system. In 1978 and 1981, heavy rains caused the dikes protecting the plant to be topped and serious flood damage and disruption of the treatment plant occurred. Other northern system considerations and concerns are trunk and interceptor sewers, sludge processing and disposal, effluent reuse, and land application treatment.

1) Northwest Treatment Plant. A summary of current and projected flow, BOD, and suspended solids loadings to the Northwest Plant system and comparative design capacities of the existing plant are given in Table 6. Basic alternatives for the system are no action, abandoning the existing plant and building a new plant at one of two downstream sites, and expanding and upgrading the existing Northwest Plant.

The Little Sac River is water quality limited with the following requirements*:

	Weekly Average	Monthly Average
BOD (mg/l)	15	10
SS (mg/l)	20	15
pH	6.0 to 9.0	
Ammonia (mg/l)	2	

a) No Action. The treatment plant would remain as it is. The existing plant is overloaded and was not designed to meet current effluent requirements, much less handle additional loads.

b) Plant Relocation - Murray Site. (Proposed in final Facilities Plan) The existing treatment plant would be abandoned and a new plant of expanded capacity would be built about 15,000 ft downstream on a tract of land of the City's abandoned Murray landfill site. The plant site will encroach on a filled area. Excavation and proper disposal of filled material, a tile drain leachate collection system, and clean fill will be required.

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* Updated waste load allocation studies were completed by the MDNR to determine requirements for increasing the Northwest Plant capacity. The updated effluent requirements are expected to be similar to the previous limits.

TABLE 6
SPRINGFIELD NORTHWEST TREATMENT PLANT CURRENT AND PROJECTED WASTE LOADINGS

Parameter	Existing Plant Design	Current*	Projected 2005
Flow (MGD)			
- Average Day	3.5	3.2	6.0
- Peak Hydraulic	5.25	--	--
- Dry Weather	--	2.4	4.8
- Peak Day	--	7.1	9.9
- Peak Rate	--	9.0	16.3
BOD (lb/day)			
- Average Day	9500	4700	9700
Susp. Solids (lb/day)			
- Average Day	6900	4200	9100

*Representative data, 1979 to 1982.

The planned treatment process is a two-stage biological treatment system providing carbonaceous BOD reduction in the first stage and ammonia reduction in the second stage. Recommended cost-effective treatment methods are orbal aeration for the first stage and submerged aerated rock filtration for the second stage.

The submerged aerated filters are expected to achieve the effluent limits without requiring final clarification or granular filtration as would be needed with other second-stage (nitrification) treatment process alternatives. This represents a relatively new and innovative process which is not fully demonstrated by similar full-scale plant applications. Current wasteload allocation studies did not indicate that final filtration was warranted; however, effluent filtration could be added later if required.*

The capital cost of the total treatment system is estimated to be $9,351,700 ($8,868,600 present worth) if effluent filtration is needed, and $7,566,200 ($7,149,500 present worth) if effluent filtration is not required. Total annual costs are estimated at $1,499,200 and $1,325,800, respectively. The new 15,000-ft Little Sac interceptor sewer is estimated to cost an additional $3,235,000.

c) Other Alternatives. Other alternatives included expansion and upgrading of the existing plant, plant relocation at the Highway 13 site, land application, and reuse. These were not found to be practical because of site constraints and costs.

2) Sludge Treatment and Disposal. A sludge holding tank and aerobic digester are recommended for the waste activated sludge stabilization. Belt filter press dewatering equipment for the sludge is also proposed. A 45-day digester detention time will be provided for sludge stabilization and pathogen die-off as required by MDNR.

Flexibility in the options for ultimate disposal will be provided as follows:

- Haul liquid sludge and dispose of on one existing and two abandoned landfill sites.

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*The selected treatment process could be different, depending upon final design decisions.

- Haul sludge cake for disposal on landfill sites.
- Haul sludge cake for disposal with solid wastes.
- Haul sludge cake for disposal on nearby farmland.

3) Interceptor and Trunk Sewers. There are approximately 14,000 acres tributary to the proposed South Dry Sac interceptor sewer, including about 1,800 acres identified as an unincorporated growth area (generally north of the Springfield city limits, south of the South Dry Sac River, east of Highway 13, and west of Valley Water Mill). There are presently about 850 residents in this area and this population is projected to increase to an estimated 9,000 by the year 2025.

Sewer needs include the 37,100-ft South Dry Sac interceptor and three lines to serve areas which currently use lift stations to pump into the Pea Ridge interceptor. Costs for these projects are estimated at $3,195,300.

2. Battlefield Subarea

The Battlefield subarea is presently served by approximately 684 individual wastewater disposal systems and an extended aeration treatment plant serving 52 residences in one subdivision. Planning for the subarea is based upon existing and projected design year population as follows:

	Population	
	1980	2005
Battlefield Residents	1,227	3,210
Unincorporated Residents	963	3,856
TOTAL	2,190	7,066

At the design population of about 7,070, the average dry weather design flow at 87 gpcd (existing water supply use) is 0.615 mgd.

Central collection and treatment alternatives evaluated for the subarea are a treatment plant discharging to Indian Springs Branch, a treatment plant discharging to the James River, a regional pump station to Springfield's James River Pump Station, a regional pump station to Springfield's Southwest Treatment Plant, and land application. Preliminary evaluation of a regional treatment plant to serve Battlefield, Brookline, and Republic indicated extremely high costs, particularly for Republic. This alternative was thus eliminated from further consideration. For the collection systems, gravity, pressure, and combination collection and on-site system alternatives were evaluated. The combination systems are least costly, and total project, annual O&M, and total annual costs of the alternatives for serving the entire subarea are presented in Table 7.

Indian Springs Branch is a losing stream and losing stream effluent requirements apply. The discharge location is approximately 0.9 mile above the confluence with the James River. The treatment system for meeting effluent requirements would consist of an oxidation ditch, two clarifiers, gravity sand filtration, and chlorine disinfection.

The James River is water quality limited based upon waste load allocations with the following requirements:

	Monthly Average	Weekly Average
BOD (mg/l)	10	15
SS (mg/l)	15	20
pH	6.0 to 9.0	
Ammonia (mg/l)	2	
Fecal Coliform (per 100 ml)	200	

The treatment system for meeting effluent requirements would be the same as that for the Indian Springs Branch treatment plant.

The alternative proposed in the final Facilities Plan consists of a regional pump station and force main southeast of Battlefield to deliver raw wastewater to Springfield's James River pump station and Southwest Treatment Plant. An emergency electric generator is provided in case of power outage. The scope of the proposed project is to pro-

TABLE 7
BATTLEFIELD SUBAREA ALTERNATIVES PRELIMINARY COSTS SUMMARY

	Total Project Cost	Annual O&M Cost	Total Annual Equivalent Cost
Indian Springs Branch Plant			
Pure Gravity	$6,378,000	$ 64,020	$679,770
Pure Pressure	5,578,200	88,875	836,930
Combination	5,469,600	53,460	646,935
James River Plant			
Pure Gravity	6,550,700	62,895	693,585
Combination	5,771,400	51,765	665,725
Regional Pump Station to James River Pump Station			
Pure Gravity	5,242,000	130,505*	638,575
Combination	4,373,600	120,500*	606,300
Regional Pump Station to Southwest Plant			
Pure Gravity	5,525,600	132,260*	665,020
Combination	4,838,600	121,135*	648,975
Land Application			
Combination	6,124,100	176,000	823,183

* Includes estimated treatment cost.

vide a combination gravity and pressure collection system and to initially serve about 1,625 persons or 408 customers within the Battlefield city limits only. The total capital cost of this more limited project is estimated at $2,483,400. Average dry weather flow would be 0.141 MGD initially. The year 2005 population served is projected at 3210 with an average dry weather flow of 0.279 MGD. Depending upon an appropriate intergovernmental agreement, operation and maintenance, as well as treatment, would be the responsibility of the City of Springfield, and Springfield's normal sewer service charges would be billed to Battlefield customers.

Another regional alternative consists of a pump station and force main northwest of Battlefield to deliver raw wastewater directly to Springfield's Southwest Treatment Plant. An emergency electric generator is provided in case of power outage.

For land application, a 1.32-acre aerated lagoon and center pivot spray irrigation system would be provided. A 31.2-acre sealed storage basin with 5½ months capacity would hold the lagoon effluent during the winter. Monitoring wells and fencing are provided. At a low application rate of 15 inches per year because of soil limitations, 551 acres are required for the application site.

3. Brookline Subarea

The Brookline subarea is presently served by individual wastewater disposal systems and a mobile home park with a package treatment plant and effluent polishing. Planning for the subarea is based upon existing and projected design year population as follows:

	1980	2005
Brookline Residents	211	298
Unincorporated Residents	302	302
Total	513	600

At the design population of 600, the average dry weather design flow at an estimated 65 gpcd* is 0.039 mgd.

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* Brookline does not have a community water supply system; therefore, actual water use figures are not available.

Central collection and treatment alternatives evaluated for the subarea are treatment plants discharging to Pond Creek at six alternative sites, a regional pump station to Republic, and a regional pump station to Springfield. Land application in the Brookline subarea and surrounding areas is not feasible because of extensive sinkhole development and other karst topography features. Lagoons or storage basins, integral parts of a land application system, would have a high risk of failure due to sinkhole collapse. For the collection systems, gravity, pressure, and combination collection and on-site system alternatives were evaluated. Total project, annual O&M, and total annual cost estimates of the alternatives for serving the entire subarea are presented in Table 8.

Pond Creek is a losing stream, and losing stream effluent requirements apply at all sites. The treatment system for meeting effluent requirements would consist of an extended aeration system, one clarifier, a recirculating rock filter, and chlorine disinfection.

One regional alternative consists of a pump station and force main to deliver raw wastewater to Republic's system.

The alternative proposed in the final Facilities Plan consists of a pump station and force main to deliver raw wastewater to the Southwest Treatment Plant via Springfield's Wilsons Creek interceptor. The force main will consist of 1,200 feet of 4-inch ductile iron pipe. An emergency overflow basin with 24-hour holding capacity will be provided at the pump station. Chlorination will be provided to help prevent the wastewater from becoming septic. A combination gravity and pressure sewer collection system will serve much of the subarea but on-site systems will continue in use in some areas. The pump station and force main are sized to serve the entire subarea.

The total capital cost of this more limited project is estimated at $1,301,800. Depending upon an appropriate inter-governmental agreement, operation and maintenance, as well as treatment, would be the responsibility of the City of Springfield. Brookline's customers would be billed at Springfield's normal sewer service charge rate.

TABLE 8
BROOKLINE SUBAREA ALTERNATIVES
PRELIMINARY COSTS SUMMARY

	Total Project Cost	Annual O&M Cost	Total Annual Equivalent Cost
Pond Creek Plant Site #1			
Pure Gravity	$2,688,400	$ 47,965	$291,200
Pure Pressure	1,801,400	40,700	218,735
Combination	1,980,030	31,270	227,870
Pond Creek Plant Site #2			
Pure Gravity	2,723,200	48,160	294,290
Pure Pressure	1,801,400	40,700	218,735
Combination	1,911,330	30,810	221,605
Pond Creek Plant Site #3			
Pure Gravity	2,700,600	47,360	291,285
Pure Pressure	1,830,600	40,700	221,345
Combination	1,989,030	30,585	227,610
Pond Creek Plant Site #4			
Pure Gravity	2,724,200	47,360	293,285
Pure Pressure	1,848,300	40,700	222,940
Combination	2,012,600	30,585	229,615
Pond Creek Plant Site #5			
Pure Gravity	2,753,900	47,360	295,820
Pure Pressure	1,859,700	40,700	223,970
Combination	2,042,300	30,585	232,140
Pond Creek Site #6			
Pure Gravity	2,792,200	47,555	299,290
Pure Pressure	1,877,600	40,700	225,485
Combination	2,077,100	30,585	235,090
Regional Pump Station to Republic			
Pure Gravity	2,859,000	54,770*	311,020
Pure Pressure	1,937,500	47,310*	235,490
Combination	2,100,700	36,520*	241,730
Regional Pump Station to Springfield			
Pure Gravity	2,553,000	61,285*	289,785
Pure Pressure	1,631,000	53,825*	214,205
Combination	1,562,400	43,520*	197,980

* Includes estimated treatment costs.

4. Fair Grove Subarea

The Fair Grove subarea is presently served by about 350 individual wastewater disposal systems; three lagoon systems serving a trailer park, a senior citizens housing project, and an individual home; and a septic tank-rock filter system for the Fair Grove School. Planning for the subarea is based on 1980 and projected design year population as follows:

Population Equivalents

	1980	1995	2005
Fair Grove Residents	863	1,501	1,929
Non-Resident Students	200 (800)*	234 (936)*	300 (1,200)*
Businesses	86	201	259
Total	1,149	1,936	2,488

*Number of students from surrounding areas; the population equivalent for determining waste load equals 0.25 times the number of students.

The year 2005 design population equivalent is thus about 2,490 and the average wet weather (including I/I) design flow at 100 gpcd** is 0.249 MGD. A ten-year phasing of facilities was evaluated.

Central collection and treatment alternatives for the subarea are a treatment plant discharging to the Pomme de Terre River, a treatment plant discharging to a branch tributary to the Pomme de Terre River, a treatment plant discharging to the Little Pomme de Terre River, a regional pump station and force main to Strafford, and 6) land treatment at two potential sites. For the collection systems, gravity, pressure, and combination collection and on-site system alternatives are presented. Total project, annual O&M, and total annual costs of the alternatives for serving the entire subarea are presented in Table 9.

The Pomme de Terre River is a gaining stream and classified for whole body contact recreation. Gaining stream effluent requirements and fecal coliform limits apply. The treatment system for meeting effluent requirements would consist of an oxidation ditch, two clarifiers, chlorine disinfection and dechlorination.

**Water use records show 87 gpcd not including school use.

TABLE 9
FAIR GROVE SUBAREA ALTERNATIVES
PRELIMINARY COSTS SUMMARY

	Total Project Cost	Annual O&M Cost	Total Annual Equivalent Cost
Pomme de Terre River Treatment Plant*			
Pure Gravity	$3,824,188	$ 50,060	$396,016
Pure Pressure	2,988,771	72,685	403,737
Combination	3,358,626	54,380	381,766
Pomme de Terre River Tributary Treatment Plant			
Pure Gravity	3,764,108	50,050	390,977
Pure Pressure	2,935,180	72,685	399,356
Combination	3,294,851	54,380	376,404
Little Pomme de Terre River Treatment Plant			
Pure Gravity	3,646,313	50,060	381,060
Pure Pressure	2,935,562	72,685	399,552
Combination	3,183,277	54,380	367,062
Land Application			
Combination	3,412,360	100,280	443,074
Regional Pump Station to Strafford			

Since the estimated annual capital cost of $116,282 for the pump station system was greater than the oxidation ditch treatment plant annual cost of $85,753, the regional pump station alternative was dropped from further consideration.

*Dechlorination costs not included.

The Pomme de Terre River tributary treatment plant is proposed in the final Facilities Plan. The receiving stream is gaining, and effluent requirements and treatment are the same as for the Pomme de Terre River, except dechlorination is not required. A combination gravity and pressure sewer system will serve most of the subarea, although a few on-site systems will remain. The total capital cost of the project is estimated at $1,208,800 with a $17,000 annual O&M cost.

For the Little Pomme de Terre River treatment plant alternative, the receiving stream is gaining, and effluent requirements and treatment are the same as at the Pomme de Terre River tributary site.

A pump station and approximately 58,000 feet of eight-inch force main would be used to transport wastewater to Strafford. This alternative would be possible only if a central system for the Strafford subarea is constructed. Chlorination would be provided at the pump station to help prevent the wastewater from becoming septic. The capital cost for the regional pump station system without considering incremental treatment costs at Strafford is higher than treatment plant alternatives. Therefore, this alternative is not further considered.

For land application a 0.53-acre aerated lagoon and center pivot spray irrigation system would be provided. A 12.6 acre sealed storage basin with 5½ months capacity would hold the lagoon effluent during the winter. Monitoring wells and fencing are provided. At a low application rate of 15 inches per year because of soil limitations, 223 acres are required for the application site.

5. Republic Subarea

The Republic subarea was withdrawn from the EIS to expedite proposed wastewater facilities improvements after findings that no significant adverse environmental impacts would result from this action. Alternatives that were considered but not found to be cost-effective were a new regional treatment plant discharging to Shuyler Creek or McElhaney Branch and serving Republic, Battlefield, Brookline; a regional pump station and force main to Springfield's Wilson's Creek Interceptor and the Southwest Treatment Plant; and land application.

6. Strafford Subarea

The Strafford subarea is presently served by individual wastewater disposal systems and a small package plant and lagoon serving a truck stop. Planning for the subarea is based on 1980 and projected design year population as follows:

	Population Equivalent			
	1980		2005	
Strafford Residents	1,121		2,682	
Strafford Businesses	--		268	
Unincorporated Residents	98		504	
Non-Resident Students	171	(684)*	222	(890)*
Total	1,390		3,676	

* Number of students

The design population equivalent is thus about 3,680, and the average dry weather design flow at 75 gpcd is 0.276 mgd.

Central collection and treatment alternatives for the subarea are a treatment plant discharging to Pierson Creek, a treatment plant discharging to Davis Creek, a treatment plant discharging to Broad Creek, a treatment plant discharging to the South Fork of the Pomme de Terre River at one of two sites, a treatment plant discharging to the Little Sac River, a regional pump station to the Springfield sewer system and the Southwest Plant, a gravity sewer along Pierson Creek to connect to Springfield's Pierson Creek interceptor and the Southwest Plant, and land application. For the collection systems, gravity, pressure, and combination collection and on-site system alternatives were considered. The combination system has gravity and pressure system areas with some on-site facilities.

Total project, annual O&M, and total annual costs for each alternative are presented in Table 10.

TABLE 10
STRAFFORD SUBAREA ALTERNATIVES
PRELIMINARY COSTS SUMMARY

	Total Project Cost	Annual O&M Cost	Total Annual Equivalent Cost
Pierson Creek Plant Combination	$4,195,100	$ 53,405	$482,885/435,600(c)
Davis Creek Plant(a) Combination	4,011,000	51,160	460,585/456,600(c)
Broad Creek Plant Combination	3,961,300	51,160	457,730/399,500(c)
South Fork Pomme de Terre Plant, Site #1 Combination	4,098,100	55,755	460,055/439,700(c)
South Fork Pomme de Terre Plant, Site #2(c) Combination	4,174,600	51,485	461,445/437,700(c)
Union 76 Site Combination	2,544,600(c)(d)	29,200(c)(d)	405,500(e)
Little Sac River Plant Combination	3,970,800	54,340	461,930/415,300(c)
Regional Pump Station to Springfield Southern System(f) Combination	3,546,200	64,875 to 87,050(b)	431,700 to/392,000(c) 453,875
Pierson Creek Sewer to Springfield Southwest System Combination	3,926,300	49,405 to 71,580(b)	445,815 to/422,800(c) 467,990
Land Applicattion Combination	4,321,600	117,750	555,082/--

(a) Based upon gaining stream effluent requirements; since determined to be losing.

(b) Depending on treatment costs.

(c) From Draft Facilities Plan, as differentiated from the other figures presented which are from earlier preliminary facilities planning comparisons.

(d) Does not include chlorination and dechlorination.

(e) Includes chlorination and dechlorination.

(f) Preliminary costs based on connection to Springfield northern system.

Pierson Creek, Davis Creek, and Broad Creek are all losing streams and losing stream effluent requirements apply. The treatment system for meeting effluent requirements would consist of an oxidation ditch, two clarifiers, gravity sand filtration, and chlorine disinfection.

The South Fork Pomme De Terre River is a gaining stream in the vicinity of Site #1 and gaining stream effluent requirements apply. The discharge is about 6.5 miles upstream of the confluence with the Pomme de Terre River and 1.2 miles upstream of the first of two small reservoirs. Because of recreational use of the reservoirs, fecal coliform in the effluent would be limited to 200 per 100 ml. The treatment system for meeting effluent requirements would consist of an oxidation ditch and two clarifiers, plus chlorine disinfection and dechlorination.

The South Fork Pomme de Terre River in the vicinity of Site #2 is a gaining stream. Discharge is below the reservoirs noted for Site #1. Effluent requirements and treatment would be the same as for Site #1. With a treatment plant at the Union 76 site*, effluent would be piped to the same discharge point as for Site #2, and the same treatment and effluent requirements apply.

Gaining stream effluent requirements apply to the Little Sac River. The discharge point is approximately 3.6 miles upstream of Fellows Lake. Since Fellows Lake is used for recreation** and is a drinking water supply source, fecal coliform in the effluent would be limited to 200 per 100 ml. The treatment system for meeting effluent requirements would consist of an oxidation ditch and two clarifiers plus chlorine disinfection.

Pumping to the Springfield southern system is proposed in the final Facilities Plan. A pump station and approximately 27,000 ft of 8" force main would be used to transport wastewater to the Springfield southern system near the quarry at Highway 65.

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*Proposed in draft Facilites Plan but changed in the final Facilities Plan to pumping to Springfield southern system.

**Springfield City Utilities does not allow whole body contact recreation at Fellows Lake.

A Pierson Creek gravity sewer to the Springfield southern system is another regional alternative. Approximately 36,000 ft of gravity sewer would transport wastewater to Springfield's proposed Pierson Creek interceptor and the Southwest Plant.

For land application, a 0.6-acre aerated lagoon and center pivot spray irrigation system would be provided. A 14.0 acre sealed storage basin with 5½ months capacity would hold the lagoon effluent during the winter. Monitoring wells and fencing are provided. At a low application rate of 18 inches per year because of soil limitations, 247 acres are required for the application site.

7. Walnut Grove Subarea

The Walnut Grove subarea is presently served by individual wastewater disposal systems. Planning for the subarea is based upon existing and projected design year population as follows:

	Population Equivalent	
	1980	2005
Walnut Grove Residents	504	670
Non-Resident Students	75 (300)*	90 (362)*
Total	579	760

* Number of students

At the design population equivalent of 760, the average dry weather design flow at 100 gpcd (existing water use of 220 gpcd appears unreasonably high) is 0.076 MGD.

Central collection and treatment alternatives evaluated for the subarea are a treatment plant discharging to an unnamed creek north of Walnut Grove, a treatment plant discharging to Sugar Creek, a treatment plant discharging to Turkey Creek, a pump station and force main to Ash Grove, and land application. For the collection systems, gravity, pressure, and combination collection and on-site system alternatives are included. Total project, annual O&M, and total annual cost estimates of the alternatives are presented in Table 11.

TABLE 11
WALNUT GROVE SUBAREA ALTERNATIVES PRELIMINARY AND FINAL COSTS SUMMARY

	Total Project Cost	Annual O&M Cost	Total Annual Equivalent Cost
Unnamed Creek Treatment Plant[a]			
Pure Gravity	$1,957,660	$31,945	$205,173/244,400[c]
Pure Pressure	1,744,925	44,420	215,820/223,100[c]
Combination/Gravity, Pressure	1,790,374	39,210	206,627/210,200[c]
Sugar Creek Treatment Plant[a]			
Pure Gravity	1,736,412	31,855	186,438/202,700[c]
Pure Pressure	1,629,771	44,330	206,037/215,000[c]
Combination/Gravity, Pressure	1,495,352/1,700,500[c]	33,545/35,200[c]	170,088/181,000[c]
Turkey Creek Treatment Plant	Costs would be similar to unnamed creek alternative because of location and losing stream effluent requirements.		
Pump Station to Ash Grove			
Gravity	2,126,426	33,610[b]	217,521/219,400[c]
Pressure/Effluent Pumps	2,020,164	46,085[b]	237,158/231,500[c]
Combination/Gravity, Pressure	1,886,167	35,300[b]	201,250/200,300[c]
Land Application			
Combination	2,079,000	51,615	250,943

[a] Based on gaining stream effluent requirements, except for footnote (c) costs.

[b] Includes estimated treatment costs.

[c] Costs from final Facilities Plan; Sugar Creek and unnamed creek alternatives meet losing stream requirements.

A treatment plant discharging to Sugar Creek is proposed in the final Facilities Plan. Sugar Creek was thought to be a gaining stream at the time the Draft Facilities Plan was prepared, but subsequent investigations have shown the lower reaches of Sugar Creek to be losing and losing stream effluent requirements apply. Turkey Creek and the unnamed creek are also losing. The treatment system for meeting losing stream effluent requirements would consist of an oxidation ditch, two clarifiers, gravity sand filtration, and chlorine disinfection.

To deliver raw wastewater to the Ash Grove system, a pump station and about 36,000 feet of 6" force main would be installed. An aerated flow equalization basin and chlorination facilities to help prevent septic conditions would be provided.

For land application, a 0.14-acre aerated lagoon and center pivot spray irrigation system would be provided. A 3.44 acre sealed storage basin with 5½ months capacity would hold the lagoon effluent during the winter. Monitoring wells and fencing are provided. At a low application rate of 15 inches per year because of soil limitations, 60 acres are required for the application site.

8. Willard Subarea

The Willard subarea is presently served by individual wastewater disposal systems. Planning for the subarea is based on 1980 and projected design year population as follows:

	Population Equivalent	
	1980	2005
Willard Residents	1,799	4,306
Willard Businesses	-	430
Unincorporated Residents	241	317
Non-Resident Students	403 (1610)*	491 (1,964)*
Total	2,443	5,544

* Number of Students

The design population equivalent is thus about 5540, and the average dry weather design flow at 75 gpcd is 0.416 MGD. Existing water use is about 60 gpcd, but 75 gpcd was used to allow for increased usage if on-site wastewater disposal constraints are removed.

Central collection and treatment alternatives for the subarea are a treatment plant discharging to Asher Creek, a treatment plant discharging to the Little Sac River, a treatment plant discharging to a Little Sac River tributary branch, a regional pump station to the Springfield system, and land application. For the central collection and treatment systems, gravity, pressure, vacuum, and combination collection and on-site system alternatives are included. Alternatives for treatment and discharge to Clear Creek were dropped earlier in the facilities planning process because of public objection.

Total project, annual O&M, and total annual costs for each alternative are presented in Table 12.

Asher Creek is a losing stream, and losing stream effluent requirements apply. The treatment system for meeting effluent requirements would consist of an oxidation ditch, two clarifiers, gravity sand filtration, and chlorine disinfection.

The Little Sac River is effluent-limited with the following requirements for the Northwest Treatment Plant based on preliminary results of the 1983 waste load allocation study:

BOD (mg/l)	20
SS (mg/l)	20
pH	6.0 to 9.0
Ammonia (mg/l)	2.0
Dissolved oxygen (mg/l)	6.0 (or 80% saturation, whichever is less)

The treatment system for a plant serving Willard and meeting similar requirements would consist of an oxidation ditch, two clarifiers, and gravity sand filtration as presented in the final Facilities Plan. (The preliminary results of the 1983 waste load allocation study indicate that a secondary treatment plant for Willard would be adequate

TABLE 12
WILLARD SUBAREA ALTERNATIVES
PRELIMINARY COSTS SUMMARY

	Total Project Cost	Annual O&M Cost	Total Annual Equivalent Cost
Asher Creek Plant			
Pure Gravity	$6,006,900	$ 53,835	$600,100
Pure Pressure	5,687,400	95,010	737,560
Combination/Gravity, Pressure, On-site	5,248,300	59,295	572,120
Little Sac River Plant			
Pure Gravity	6,306,600	53,710	625,265
Pure Pressure	5,723,700	93,120	738,460
Combination/Gravity, Pressure, On-site	5,527,200	59,430	595,720
Regional Pump Station to Springfield			
Pure Gravity	5,314,300	76,100 to 119,980*	556,100 to 599,980
Pure Pressure	5,235,200	119,185 to 156,145*	715,850 to 752,810
Combination/Gravity, Pressure, On-site	4,555,200	80,730 to 117,690*	527,250 to 564,210
Land Application			
Pure Gravity	6,501,500	125,960	723,895
Pure Pressure	6,183,100	167,535	861,765
Combination/Gravity, Pressure, On-site	5,743,400	131,820	696,370

*Depending on treatment costs.

for discharge to the Little Sac River. Filtration would not be required to meet secondary treatment effluent limitations.)

A site on a small tributary branch of the Little Sac River was considered. Geological investigation showed this to be a losing stream, and losing stream effluent requirements would apply. Treatment would be the same as for the Asher Creek plant.

A regional pump station to Springfield is proposed in the final Facilities Plan. A pump station and about 33,000 ft of force main would be provided to deliver raw wastewater to the Springfield Airport Branch Trunk and Northwest Treatment Plant. A 24-hour holding basin would be provided at the pump station to handle peak flows and provide storage in case of failure. Chlorination at the pump station would be provided to help prevent the wastewater from becoming septic.

The total capital cost of the proposed project is $3,153,600. The project would initially provide a gravity collection system only for sub-basins "A and B" of the Willard subarea. Other areas would continue to be served by on-site systems. Treatment capacity would be based on the year 2005 waste load from the entire subarea. Depending upon an appropriate inter-governmental agreement, operation and maintenance, as well as treatment, would be the responsibility of the City of Springfield, and Springfield's normal sewer service charges would be billed to Willard customers.

For land application, a 1.0 acre aerated lagoon and center pivot spray irrigation system would be provided. A 23.4 acre sealed storage basin with 5½ months capacity would hold the lagoon effluent during the winter. Monitoring wells and fencing are provided. At a low application rate of 18 inches per year because of soil limitations, 345 acres are required for the application site.

9. Unincorporated Low Growth Subarea

The unincorporated low growth subarea is served almost entirely by septic tank wastewater disposal systems. Planning for the subarea is based on 1980 and projected population as follows:

Population

	1980	2005	2025
Residents	13,461	16,169	17,562

At 2.8 persons per household, there would be about 4808 homes in the subarea of which 409 are in platted subdivisions and the remainder scattered throughout. At an estimated 85 gpcd, the year 2005 wastewater flow would be 1.374 MGD from residences and small commercial establishments.

Wastewater disposal alternatives for the low growth subarea are improvement of existing individual systems, and construction of small central collection and treatment systems or cluster systems for subdivisions and other more densely developed areas. The methods and criteria discussed in this section may also be applied as at least interim solutions for other unsewered subareas.

The conventional septic tank and absorption field is widely used for on-site treatment. Variations and alternatives to this system include:

- septic tank and dosed or pressurized absorption field distribution
- aerated tank and absorption field
- aerated tank and sand filter
- mound system
- lagoon
- septic tank and recirculating rock filter
- activated sludge treatment plant
- land application

The last four systems usually have a surface discharge of effluent while the others are designed for subsurface liquid disposal.

Methods to modify wastewater characteristics through reduction of flow or pollutant mass should be considered. Good practice requires that water conservation/flow reduction be employed at a dwelling served by an on-site wastewater system.

a. Improvements of Subsurface Disposal Systems. Common types of failures of septic tank and absorption field systems are wet weather surfacing of effluent, long-term clogging of absorption fields, and ground water contamination. If the soil percolation rate is 120 minutes per inch or less (percolation test time greater than 120 minutes) flooding during periods of heavy rain is likely regardless of effluent loading per sq ft of trench or trench spacing. Long-term plugging of the absorption field can be caused by: formation of a biological mat which clogs the soil voids, particularly, under anaerobic conditions; improper smearing or compaction of the soil face during construction; and overflow of solids from the septic tank. Groundwater contamination may occur in areas of shallow fractured bedrock, periodic high water table, saturated soils, and soils that percolate too rapidly or contain holes or other large openings. Surfacing effluent in fragipan soils may reenter the ground water through sinkholes or other interconnections.

Key factors in on-site subsurface disposal are unsaturated soil conditions, aerobic periods for absorption field recovery, proper construction practices, proper pre-treatment, and adequate operation and maintenance. The variations to conventional septic tank systems are attempts to remedy particular problems, but are not without cost and other possible performance disadvantages that must be weighed.

Continued use of on-site treatment systems with proper system design, construction, and operation is environmentally sound for many parts of the unincorporated low growth subarea. Criteria developed in the Facilities Plan are:

Criterion	Adsorption Fields	Mound Systems	Land Application
Depth to rock or restrictive layer (ft)	5	2	2
Depth to water table (ft)	5	2	2
Percolation rate (min/in)	10 to 100	0 to 100	10 to 100
Surface flooding	Rare,	Occasional, Brief	None Brief
Maximum Slope (%)	15	15	15

These criteria will require site evaluation in addition to the common percolation test. Additional design parameters for subsurface disposal systems are:

Adsorption Systems

Loading rate (gpd/sq ft)	Varies from 0.2 to 0.65 depending on percolation rate from 90 to 10 min/in, respectively
Trench width (ft)	2
Maximum trench length (ft)	100
Trench spacing (ft)	10 center to center
Maximum trench depth (ft)	2
Trench grade	Flat
Application method	Dose twice per day for slopes less than 5%; gravity for slopes greater than 5%
Construction Period	Dry soil required

Additional criteria for mound systems, land application systems, and septic tank pretreatment features are presented in the Facilities Plan and Draft EIS.

b. Improvement of Surface Disposal Systems. Surface disposal systems treat the wastewater to an acceptable level, then discharge it to a surface waterway such as a ditch or stream, not depending upon soils for final treatment. The systems will vary depending upon effluent requirements and cost and design processes, considerations similar to those for municipal systems as previously described. Inadequate operation and maintenance of such small systems is a widespread problem and failures may occur from periodic upsets of the treatment process, system overloading, and systems that do not meet current regulations. Small mechanical treatment plants are often prone to process upsets because of operating deficiencies and wasteload fluctuations. Lagoon systems may not produce satisfactorily effluent or may leak excessive or poorly treated flow to the subsurface. "No-discharge" lagoons may discharge periodically during wet periods as well as leak wastewater to the subsurface.

c. Modification of Wastewater Characteristics. Wastewater modification methods encompass three basic interrelated strategies: water conservation and wastewater flow reduction, pollutant mass reduction, and on-site containment for off-site disposal. Each strategy attempts to reduce the influent wastewater loading to the on-site disposal system. Flow reduction methods include the elimination of wasted water; water-saving devices, fixtures, and applicances; and water recycle systems. Over 70 percent of typical residential wastewater flow is generated by toilet flushing, bathing, and clothes washing and efforts towards flow reduction should be so directed. Methods to modify wastewater characteristics are discussed further in the Draft EIS.

d. On-Site System Management. Adoption of an on-site system management plan is a controversial issue (but necessary for effective and proper on-site system use in areas such as these) and requires many detailed items to be effective. The goals of the plan would be:

- Sound design and construction practices.
- Periodic inspection to detect problems.
- Periodic removal of septic tank solids with proper disposal.
- Periodic maintenance of pumps, dosing siphons, and other equipment.
- Wastewater characteristics modification, particularly flow reduction.

D. IMPACTS OF THE RECOMMENDED ALTERNATIVES

Some beneficial and adverse impacts can be expected from the construction and operation of the various wastewater collection and treatment alternatives considered for the planning area. Impacts of the recommended alternatives will generally be beneficial, particularly to surface and ground water quality and efficient land use planning. The proposed alternatives would replace or eliminate inadequate wastewater treatment plants and provide suitable collection and treatment systems at communities with serious problems of failing septic tank systems.

Some adverse impacts associated with the recommended alternatives will be relatively minor, and many will be of a short-term nature. These include the erosion, sedimentation, and damage to riparian habitat associated with sewer construction in stream corridors, and the traffic disruption, safety hazards, and noise caused by construction in urban areas. In addition to construction impacts, there are also potential long-term adverse impacts that should be mitigated. These include measures to avoid or minimize the hazard of sewer line failure in sinkhole areas and avoid or minimize the effects of construction on archaeological resources. Environmental analyses, mitigative measures, and remedial actions will be required at two landfill sites which affect and are affected by construction of proposed Springfield northern system facilities.

Cost impacts of collection and treatment systems to residents of the unsewered subareas will be great, despite efforts to reduce costs and the potential for grant assistance (see Tables 13 and 14). Officials and citizens of these communities have participated in the planning for these subareas and their views are generally reflected in the proposed plans. Cost impacts for residents of Springfield and Republic will be moderate. Impacts of the recommended alternatives are discussed by subarea in the following sections.

1. Springfield Subarea

a. Southern System. Possible wastewater management improvement alternatives for the southern system are still in preliminary planning stages, but could provide significant environmental benefits. Additional sludge stabilization prior to land spreading will reduce odor problems and complaints from nearby residents and help to assure that land continues to be made available by local farmers for this purpose. Effluent reuse by the City Utilities Southwest Power Plant could improve the ultimate quality of the effluent discharge and of the receiving stream through advanced treatment, including nutrient removal. A sewer system evaluation survey (SSES)* would be beneficial in determining how to cost-effectively control the most serious I/I problems of the southern system, and control or reduce collection and treatment system

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*A study to identify specific problems where excessive I/I are indicated.

TABLE 13
ESTIMATED USER CHARGES

Community	Community Share to Finance[(a)]	Average Annual User Charges[(b)]	One-Time Hook-Up Fee
Battlefield	$1,511,000	$746	$368
Brookline	628,000	813	164
Fair Grove	1,622,000	756	410
Republic	1,100,000	140	15
Springfield	4,000,000	84	--
Strafford	1,907,000	846	358
Walnut Grove	970,000	828	307
Willard	2,038,000	807	400

(a) Based upon estimated costs for 1984-1985. Republic and Springfield Northwest Plant costs are based on pre-October 1984 Federal and State grant contributions for eligible items; others are based on grant contributions that apply after October 1984.

(b) In 1984-1985 dollars and based on revenue bond amortization at 10 percent annual interest over a 20-year period. The payments cover bond retirement and an additional 30 percent bond reserve fund plus operation and maintenance costs.

TABLE 14
USER CHARGES/HOUSEHOLD INCOME COMPARISON

Community	1980 Median Household Annual Income (a)	Average Annual User Cost (b)	User Cost Percent of Median Household Annual Income	EPA Threshold Percentage (1980 Income)
Battlefield	$22,218	$533	2.4	1.75
Brookline	18,267	581	3.2	1.75
Fair Grove	15,488	683	4.4	1.5
Republic	17,451	130 (c)	0.7 (c)	1.75
Springfield	14,881	84 (d)	0.6 (d)	1.5
Strafford	14,897	604	4.1	1.5
Walnut Grove	10,477	592	5.7	1.5
Willard	17,755	577	3.2	1.5

(a) 1979 income multiplied by Consumer Price Index factor of 1.135.

(b) 1984-1985 user charges of Table 13 adjusted to 1980 dollars.

(c) Costs of new and existing facilities, including current charges of about $2.50 per month, depending on metered water use.

(d) Costs for new and existing facilities including current average charges of about $6.40 per month.

overflows. The longer-range decision on whether to expand the Southwest Treatment Plant or build a new James River basin plant should not have a major differential impact on water quality of Wilsons Creek and the James River. Significant land use and archaeological resource impacts are not anticipated for the Southwest Treatment Plant expansion alternative.

The collection system alternatives for the southern system are compatible with land use planning to serve prime development areas. Numerous small wastewater treatment and pumping facilities will be eliminated and developments now on dead sewers will be served. Significant adverse impacts from construction include erosion and turbidity from streambed construction, disturbance of archaeological resources, and loss of bottomland wildlife habitat. Individual lines with 10 to 25 percent of their alignment through bottomland woods are the Pierson Creek interceptor, P-3, P-9, J-1, Thompson Branch interceptor, and WB-3.

The Pierson Creek basin facilities will help protect the water quality at Springfield's James River water supply intake. The Pierson Creek and Thompson Branch facilities will also reduce eutrophication potential of Lake Springfield. The collection facilities will have a beneficial impact on present and future James River water quality and ground water quality.

Survey of the Pierson Creek interceptor extension route revealed prehistoric site 23GR550 that is potentially eligible for inclusion in the National Register of Historic Places. The interceptor extension alignment should be modified to avoid this site. An archaeological survey and plans to mitigate the impacts of previously designed Pierson Creek interceptor facilities have been done in the past. No action has been taken on the recommended mitigative measures.

b. Northern System. Replacing the existing Northwest Treatment Plant with a new and expanded advanced treatment facility downstream is needed because the existing facility is becoming overloaded and was not designed to meet current effluent requirements.

The existing plant is not suitable for continued use and expansion because of severe site flooding problems, the structural problems of constructing plant additions on a landfill area, and the need for extensive facilities rehabilitation.

Because the proposed Murray site is 15,000 ft downstream of the existing plant, there will be adverse impacts from further extending the plant interceptor along the Little Sac River. Adverse impacts to archaelogical resources, prime farmland, and bottomland woods, and added stream turbidity and soil erosion from construction would occur along the interceptor alignment. Removing effluent from the reach of stream below the existing Northwest Plant to the proposed site would reduce the dry weather streamflow available for aquatic life and livestock watering. (The upstream water supply reservoirs already affect streamflows in this reach.)

The proposed South Dry Sac interceptor system is compatible with land use planning to serve prime development areas. Several small wastewater pump stations will be eliminated. Significant adverse impacts from construction include erosion and turbidity from streambed construction, disturbance of archaeological resources, and loss of bottomland wildlife habitat. The South Dry Sac interceptor will benefit the longer-term water quality of South Dry Sac Creek, including Valley Water Mill, a component of Springfield's water supply sources.

An archaeological survey of the proposed South Dry Sac interceptor route revealed eleven prehistoric sites: 23GR539, 23GR540, 23GR541, 23GR542, 23GR543, 23GR544, 23GR545, 23GR546, 23GR547, 23GR548, and 23GR549. Seven of the sites, as underlined above, are potentially eligible for inclusion in the National Register of Historic Places. The interceptor alignment should be modified to avoid these sites, or, if avoidance is not possible, test excavations should be conducted to determine their significance.

An archaeological survey of the Little Sac interceptor route (from the existing Northwest Treatment Plant to the proposed Murray site) and new plant site revealed six archaeological sites. Five prehistoric sites are assessed as potentially eligible for inclusion in the

National Register of Historic Places. The project should be modified to avoid these sites; or, if avoidance is not possible, test excavations should be conducted to determine their significance.

The Fulbright and Murray landfills in Springfield, Missouri, are currently listed as uncontrolled hazardous waste sites. The Fulbright Landfill is on the Superfund National Priorities List. EPA is aware that the City of Springfield now plans to construct a treatment plant at the Murray Landfill and an interceptor and leachate collection system that will cross both landfills. The Superfund Program intends to evaluate the impacts of this construction as a part of its remedial investigation of the landfills. The investigation will eventually lead to the implementation of remedial actions at the sites.

The implementation of remedial actions at the sites will not occur until after EPA completes a Remedial Investigation/Feasibility Study of the landfills. In the investigation, the Superfund Program will take into account the proposed interceptor and wastewater treatment plant construction in determining the possible required remedial actions. The investigation will be conducted and remedial action taken pursuant to Sections 104 and 106 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 USC 9604 and 9606.

All environmental analyses, mitigative measures, and remedial actions required at the landfills will be determined by the Superfund Program and shall include any adverse impacts associated with the installation of the proposed treatment plant and interceptor.

2. Battlefield Subarea

The proposed force main to the James River pump station and Southwest Plant should have less impact on archaeological resources and bottomland woods wildlife habitat than other alternatives.

An archaeological survey of the route of the proposed force main revealed prehistoric site 23GR553, which is potentially eligible for inclusion in the National Register of Historic Places. The force main alignment should be modified to avoid this site.

All central collection and treatment alternatives will result in very high user charges and will be difficult for the City of Battlefield to finance, even with grant assistance.

3. Brookline Subarea

Receiving stream impact is a major environmental concern since all discharge alternatives involve losing streams. Adverse impacts of the proposed pump station and force main to Springfield's Wilsons Creek interceptor and Southwest Treatment Plant are judged to be less because of the larger scale and proven performance of the existing treatment facilities.

The annual equivalent cost of pumping to Springfield is also estimated to be significantly less than other alternatives. The proposed alternative will result in very high user charges and will be difficult for the City of Brookline to finance, even with grant assistance.

4. Fair Grove Subarea

Each of the discharge alternatives would impact the Niangua darter. The proposed alternative which discharges to a tributary of the Pomme de Terre River is much preferred over discharge directly to the Pomme de Terre River. Providing dechlorination or an alternate disinfection process, such as ultra-violet light disinfection, should be considered since the discharge point is only about one mile above the confluence with the Pomme de Terre River.

The proposed central collection and treatment alternative will result in very high user charges and will be difficult for the town of Fair Grove to finance, even with grant assistance.

An archaeological survey of proposed routes of some collection system components and the Pomme de Terre River tributary treatment plant site (prior to revision of the site since the Draft Facilities Plan) revealed prehistoric site 23GR538 along a proposed force main route. The site is potentially eligible for inclusion in the National Register of Historic places. Force main alignment should be modified to avoid this site.

5. Republic Subarea

The Republic subarea has been withdrawn from the EIS. Earlier evaluation found that proposed upgrading of the system, with improvement of effluent quality to meet losing stream standards and elimination of the existing lagoons with their potential for catastrophic collapse, will greatly benefit both surface and ground water quality.

6. Strafford Subarea

Other than high user charges and financing difficulty, no major adverse environmental impacts should result from the proposed pump station and force main to Springfield's southern system.

7. Walnut Grove Subarea

Since the time the draft Facilities Plan and Draft EIS were released, the Missouri Geological Survey determined that all discharge alternatives involve losing streams. Each of the discharge alternatives impact small streams that might be inhabitated by the Niangua darter (*Etheostoma nianguae*). Pumping wastewater to Ash Grove is preferred environmentally, but costs are significantly higher than for the proposed Sugar Creek treatment plant, even with added treatment to meet losing stream requirements.

All central collection and treatment alternatives will result in very high user charges and will be difficult for the City of Walnut Grove to finance, even with grant assistance.

8. Willard Subarea

A new wastewater treatment plant on the Little Sac River would have no major adverse environmental impacts. The proposed regional pump station to Springfield's northern system would also be rated favorably except that there is potential for severe ground water contamination from sewer line collapse or leakage as the proposed force main crosses the extensive sinkhole plain between Willard and Springfield. Mitigation of this impact should be required.

All central collection and treatment alternatives will result in very high user charges and will be difficult for the City of Willard to finance, even with grant assistance.

9. Unincorporated Low Growth Subarea

The Facilities Plan presents sound technical guidelines for on-site system design, construction, and operation. Emphasis should also be placed on flow reduction and other means to modify wastewater characteristics. Adoption and implementation of an on-site system management plan will be needed for effective application and enforcement of technical policies. The goals of the plan include sound design and construction practices; periodic inspections; periodic removal and proper disposal of septic tank solids; maintenance of pumps, dosing siphons, and other equipment; and wastewater characteristics modification.

Varying approaches and many detailed items need to be addressed in implementing an on-site system management plan. Planning and zoning regulations and building codes are important tools and are being used to a limited degree in Greene County. Licensing of system installers plus inspections during installation are useful approaches. Programs to reinspect, maintain, and upgrade existing systems are needed, but are often controversial, difficult, and expensive to implement.

E. ISSUES AND COMMENTS IN RESPONSE TO THE DRAFT EIS

The primary issues and comments in response to the Draft EIS are detailed in Section IV of the Final EIS. Principal comments on alternatives and impacts included:

- Concerns about the costs of proposed projects for unsewered communities.
- Request for further information and consideration of land application alternatives, particularly for Fair Grove.
- Concern about the impact on private wells of the proposed Walnut Grove treatment plant with discharge to Sugar Creek, a losing stream.
- Concern about nutrient and other impacts on Wilsons Creek and the James River from continued and increased Southwest Treatment Plant discharges.
- Concern about leachate and plant siting problems with respect to landfill impacts on the proposed new Northwest plant.
- Endorsement of improved on-site system management in the planning area.
- Concerns about water supply source protection.
- Concerns about compatibility of the proposed actions and proper land use planning and prime farmland impacts.

III. REVISIONS TO THE DRAFT EIS

Comments on the Draft EIS revealed the need for some corrections or additional information. Changes consistent with recent developments on the final Facilities Plan are also included.

Revisions (and errata) to the Draft EIS and corresponding comment(s), where applicable, are listed below:

Revisions	Comment(s)
Page 12, par. 1, lines 1-3: Revise sentence to read: The Salem and Springfield plateaus contain one of the nation's greatest concentrations of springs, as well as several of the largest.	W-4 W-53
Page 16, Figure 5: A revised Figure 5, Faults, is presented.	W-54
Page 28, par. 4, lines 4 and 5: Revise to read: "...the route of the Burlington Northern Railway (formerly the St. Louis and San Francisco Railway)."	W-6
Page 49, par. 1, line 3: Revise to read: "...depths of about 400 feet."	W-91
Page 67, Table 7: A revised Table 7 presents more current water supply data.	W-44
Page 81, add at the end of paragraph 2: A 1980 study found that 28 percent of 130 wells sampled in unincorporated areas of Greene County were bacteriologically unsafe. Problem areas were to the west, northwest, and the urbanized periphery of Springfield (233).	W-9

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TABLE 7 (Revised)

CHARACTERISTICS OF SPRINGFIELD'S DRINKING WATER SUPPLY SOURCES

Parameter	Blackman Plant James River Source[a]	Fulbright Plant All Sources[b]
pH	8.0	7.7
Color	10	9
Turbidity	5	3.7
Total Coliform (per 100 ml)	2,000	1,000
Fecal Coliform (per 100 ml)	500	150
Total Alkalinity as $CaCO_3$ (mg/l)	145	168
Total Hardness as $CaCO_3$ (mg/l)	165	186
Calcium Hardness as $CaCO_3$ (mg/l)	135	162

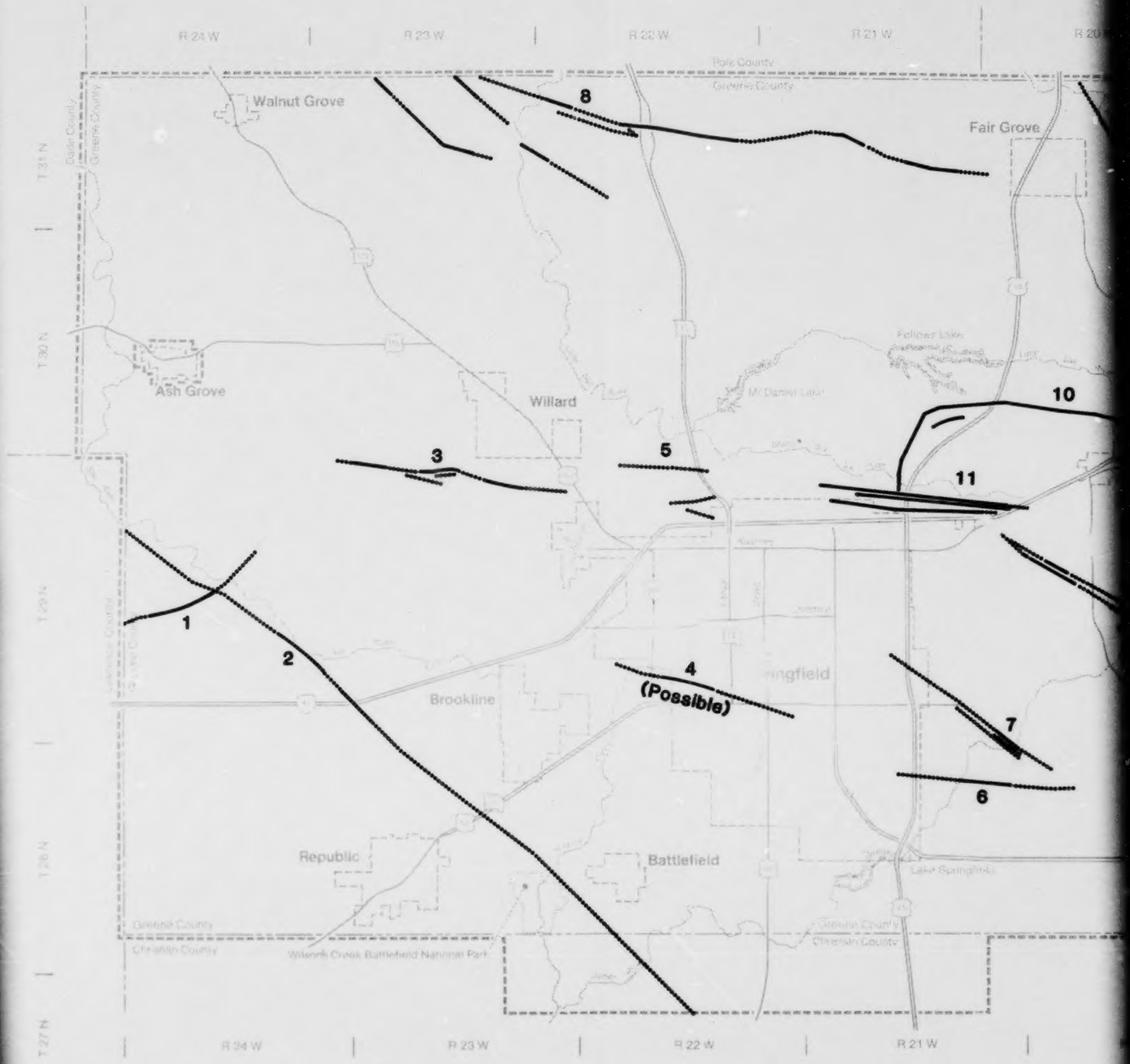
---

[a] Typical of samples during calendar year 1983 when Fellows Lake water was not being treated at the Blackman Plant.

[b] Average of samples during calendar year 1983. Other analyses for pesticides and heavy metals indicated no problems with generally non-detectable levels.

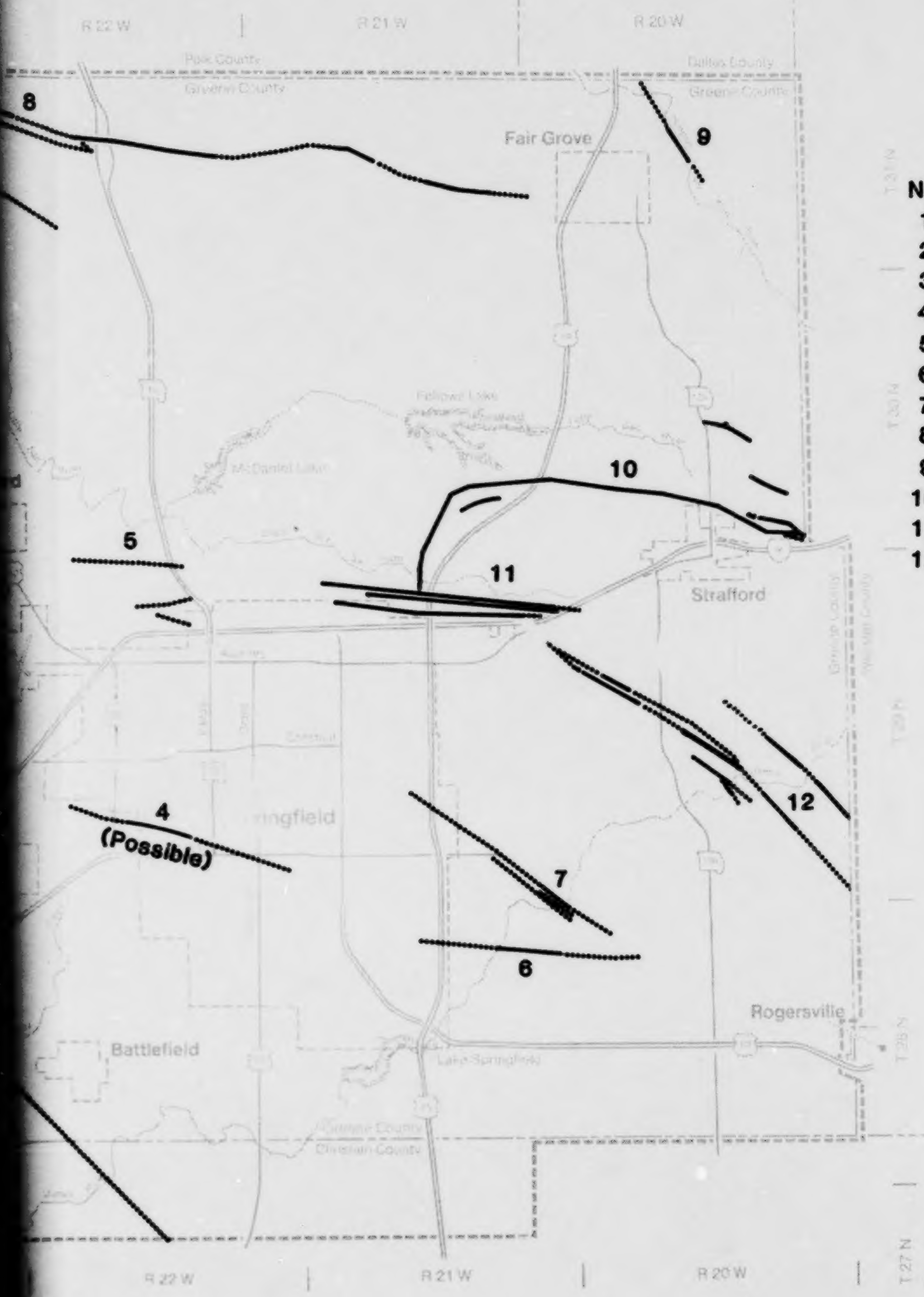
Source: Springfield City Utilities, Yearly Analysis Summary, 1983; (nitrate not listed).

A


R 24 W
R 23 W
R 22 W
R 21 W
R 20 W
Polk County
Greene County
Walnut Grove
8
Fair Grove
T 31 N
Dade County
Greene County
T 30 N
Ash Grove
Willard
McDaniel Lake
Fellows Lake
10
3
5
11
T 29 N
1
2
4
(Possible)
ngfield
Brookline
7
6
Republic
Battlefield
T 28 N
Lake Springfield
Greene County
Christian County
Greene County
Christian County
Wilsons Creek Battlefield National Park
T 27 N
R 24 W
R 23 W
R 22 W
R 21 W

Reproduced from best available copy.

B


R 22 W
R 21 W
R 20 W
Polk County
Greene County
Dallas County
Greene County
8
Fair Grove
9
T 31 N
Fellows Lake
McDaniel Lake
T 30 N
10
5
11
Strafford
Greene County
Webster County
T 29 N
4
(Possible)
ngfield
12
7
6
Rogersville
Battlefield
Lake Springfield
T 28 N
Greene County
Christian County
T 27 N
R 22 W
R 21 W
R 20 W

Faults (Revised)

Figure 5

Names of Faults
1. Sycamore Creek
2. Sac River - Republic
3. Clear Creek
4. Fassnight
5. Ritter
6. Kinser Bridge
7. Pierson Creek
8. Graydon Springs
9. Fair Grove
10. Strafford
11. Valley Mills
12. Sawyer

Legend

Fault (Dotted Where Inferred)

Sources: (12,15)

Planning Area
City Limits
County Limits

Miles 1 2 3 4
Kilometer 1 2 3 4 5 6
North

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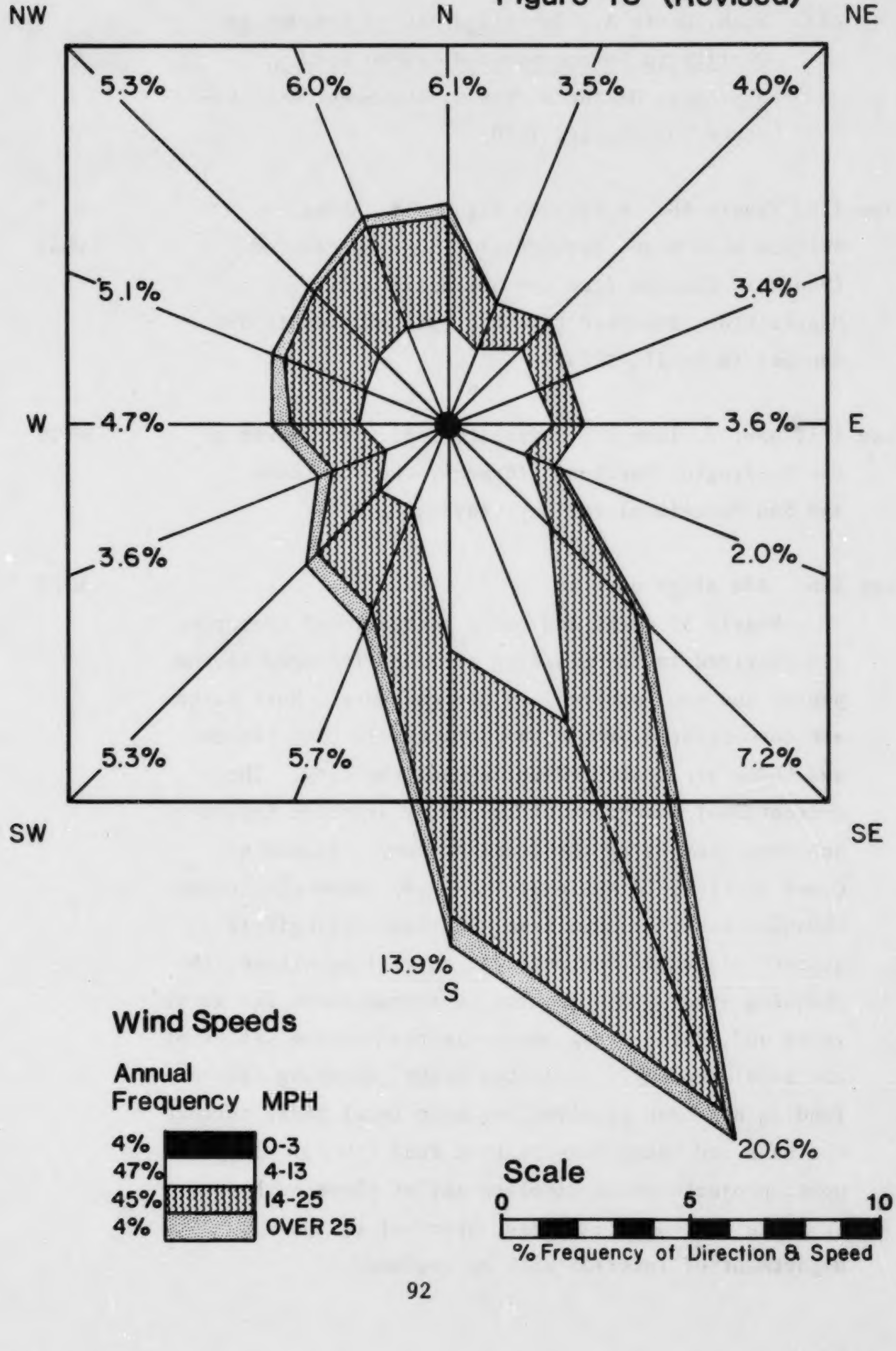
Revisions	Comment(s)
Reference: 233. Bush, Bruce A., Investigation of Groundwater Quality in Unincorporated Greene County, Missouri, Master's Thesis, Southwest Missouri State University, 1980.	
Page 126, Figure 18: A revised Figure 18, Annual Surface Wind Rose, Springfield, MO is presented. (Source: Excerpt from the Springfield Airport Master Plan, received from the Springfield Airport Manager in April, 1984.)	W-17 W-58
Page 171, par. 2, line 2: Revise to read: "...north of the Burlington Northern (formerly the St. Louis and San Francisco) railway tracks."	W-10
Page 186: Add after par. 5: Nearly 50 parks and other recreational resources are provided in the planning area and included in the public and semi-public land use category. Most parks are concentrated within the Springfield city limits and these are scattered throughout the city. The recreational resources of the study area are important contributors to the local economy. Wilson's Creek Battlefield National Park, two commercial caves, McDaniel Lake, Fellows Lake, and Lake Springfield attract visitors from outside, as well as within, the planning area. This results in expenditures for local goods and provides employment in the tourism sector of the local economy. As listed below, matching federal funding has been received for many local parks through the Land and Water Conservation Fund (LWCF). If proposed projects would displace any of these park areas from their present land use, approval by the U.S. Department of Interior will be required.	W-83

Annual Surface Wind Rose
Springfield, Mo.

Figure 18 (Revised)



Revisions Comment(s)

PLANNING AREA PARKS THAT HAVE RECEIVED LWCF CONTRIBUTIONS

(Source: Outdoor Recreation Assistance Program, Missouri DNR)

Park Name	Location
Fred Miles Park	Springfield
Springfield Neighborhood Parks	Springfield
Ritter Springs	Springfield
Springfield Neighborhood Parks	Springfield
Ballfield Development	Springfield
Grandview Golf Course	Springfield
Neighborhood Park - Bissett Area	Springfield
Model Airplane Park Development	Springfield
Zagony Park Development	Springfield
Springfield Parks Development	Springfield
Springfield Scenic and Bennett Park	Springfield
Springfield Tennis Court Development	Springfield
Fassnight	Springfield
Silver Spring	Springfield
Nathaniel Greene	Springfield
Greene County Overhill Park Development	Greene County
Fair Grove Mound Park	Fair Grove

Page 311, par. 2: Delete the last sentence and substitute: If avoidance is not feasible, then each sinkhole and losing stream crossing should be examined to determine the best methods of crossing to avoid problems with structural integrity, contaminating ground water, or impeding normal drainage. Sealing of sinkholes and losing stream areas might be the recommended solution in some cases. W-42 W-51

Revisions Comment(s)

Page 313: Add at the end of par. 5: W-19

Specific mitigative measures relative to flood plain development and stream crossings include the following:

- Establish flood plain ordinance with use standards for floodway areas and fringe areas.
- Prohibit construction or encroachment in floodway areas.
- Establish base flood elevation and prohibit construction which increases this elevation.
- Elevate structures in fringe areas on piles or columns instead of embankments.
- Prohibit encroachment in fringe areas.
- Design and construct stream crossings so that the cross-sectional area is not reduced and flow is not obstructed. Burying the pipe often satisfies these criteria.

Page 320: Add at the end of par. 1: W-45

Minor benefits to the water quality and aquatic ecology of small streams may result from effluent discharges if the receiving stream's capacity to assimilate the wastes (by absorbing them into the existing food web) is not exceeded, and the receiving stream has intermittent flow. Given a steady baseline streamflow, a series of aquatic communities will develop to fill the niches available and utilize the food resources contained in the discharge.

Page 326: Add at the end of par. 1: W-37

The rock profile should be determined before construction. Where rock excavation is required in cavernous areas, specific investigations should be made to determine the best method of rock removal in order to preserve the bedrock integrity. W-41 W-59

Revisions	Comment(s)
Page 335: Add at the end of par. 1: Very high sewer user charges, such as those estimated for proposed projects for the unsewered communities in the planning area, could cause some prospective new residents and some existing residents to locate elsewhere and thus reduce growth. This impact is weighed against the problems of reduced growth and other adverse impacts where on-site wastewater disposal problems are severe.	W-81
Page 343: Add after par. 1: Plans and specifications should have provisions for possible encounters with hazardous materials and specific measures for which the contractor will be responsible and liable.	
Page 361: Add after last paragraph: Construction of proposed facilities will not have significant adverse impacts on park and recreation resources. No park land, including those assisted through the LWCF program, will be displaced as a result of construction. (A small collection line for the proposed Fair Grove system was checked and found to be about one-fourth of a mile from Fair Grove Mound Park.)	W-83

Errata

Page 29, Figure 8: Correct spelling is "Viraton."

Page 45, par. 4, line 4: Correct spelling is "artificially."

Page 46, par. 3, line 4: Delete "shelfstone" and substitute "siltstone."

Page 46, par. 4, line 3: Correct spelling is "stratigraphic."

Page 59, par. 2, line 6: Correct spelling is "sufficient."

Page 84, par. 1, line 7: Correct spelling is "significance."

Page 167, par. 6, line 1: Delete "are being constructed."

Page 168, par. 2, line 15: Correct spelling is "Fellows"; delete "(not complete)."

Page 172, par. 2, last line (15): Revise to read "... Springfield area are..."

Page 311, par. 5, line 1: Correct spelling is "beneficial."

Page 314, par. 1, line 3: Correct spelling is "accidental."

Page 347: Impact on Terrestrial Ecology - Loss of Habitat for collection system alternative 4 should be "-1."

IV. COMMENTS ON THE DRAFT EIS AND EPA RESPONSES

The Draft EIS was published and made available to the public in late January 1984. The Draft EIS was provided to various Federal, State, and local agencies, concerned individuals, and interest groups. The public hearing was held in Springfield, Missouri on March 13, 1984. In addition to the public comments at the hearing (a transcript provided herein), a number of letters were received and are included in this Final EIS.

The designations in the margins of the letters identify specific comments for which responses are given. The responses follow all of the letters. Similarly, designations in the margins of the hearing transcript identify comments for which responses are given. Where public hearing comments were similar to the written comments, transcript responses refer to the written comment responses.

A. WRITTEN COMMENTS AND RESPONSES

Written Comments Index

Comment(s)	Name	Agency
W-1	Glenn E. Dillon	Citizen
W-2	Lance Long	U.S. Department of Housing and Urban Development
W-3	Robert R. Schaefer	Springfield Department of Public Works
W-4 to W-13	Steve Stettes	Citizen
W-14 to W-20	Karen Entrup	Citizen
W-21 to W-28	Christopher J. Ives	Citizen
W-29 to W-38	Shirley Gammon	Citizen
W-39 to W-42	Stanley Huck	Citizen
W-43 to W-47	Joel C. Keller	Citizen
W-48 to W-52	Gary W. Krizanich	Citizen
W-53 to W-68	Wendell L. Barner	Citizen

Comment(s)	Name	Agency
W-69 to W-74	Drew M. Holt	Citizen
W-75 to W-81	Mark T. Premont	Citizen
W-82 to W-89	Sheila Minor Huff	U.S. Department of Interior
W-90	Helen Murray White	Citizen
W-91	Glenn E. Dillon	Citizen
W-92 to W-93	Craig Skinner	Citizen

Feb 7, 1984
Springfield MO

Edward Vest
Chief Environmental Impact Section
324 E. Eleventh St
Kansas City Mo 64106

Thank you for making available a copy of the Draft Environmental Impact Statement for Proposed wastewater Treatment Facility, Greene County MO

I know you rely upon information that has been made available to you to print this draft however I question what the situation is regarding the quality of Groundwater in this County.

W-1

During the latter part of 1983 I undertook to do some sampeling of some springs in this County.

I find that information at the Dept of Natural Resources are really outdated. Most of which were done by Mr Vinyard and recorded in a book entitled Springs of Missouri

Reproduced from best available copy.

Appendix B, Table B-2 titled discharge of Major Springs were evidently taken from these same records

These dates on these records show them to have been made from 1932 to 1964

In the last 20 yrs many houses have been built in the area which is served by Septic Tanks

The last 20 yrs we have been busy doing Studies, Investigations and more Studies but few samples.

Nitrates found in Spring water is an indication of decomposition ~~fol~~ plant or animal life and should be an important factor in determinating water quality. The same test done on well water from the lower aquifier should also determine whether surface water is entering the aquifer.

Each Septic tank is returning thousands of gallons of water to the surface and therefore this should be taken into consideration as to whether the water is better or worse.

Just off Highway 13 and close to the old landfill is an abandoned lime quarry.

City Utilities ~~has~~ a monatory well located near by.

While it was being used to deposit sludge from the water treatment plant it was in use. I find that no monatory is done and I think it is as important to monitor it now as when it was in use.

Enclosed is a copy of a report that I turned over to Mr Roundree a few days before C U decided not to accept Sewage from Rogersville MO

Reproduced from best available copy.

I plan to be at the hearing March 13, 1984 and would like to address these issues.

I am a retired water well contractor and reside at 309 west Kingsbury Springfield MO 65807 Telephone 417-8313813

Mr.& Mrs.Glenn E.Dillon
309 W. Kingsbury
Springfield, MO 65807

Springfield, MO
February 1, 1984

The information in this report was obtained in order to determine whether the water in this county is polluted.

Page (1) lists two springs and two wells. These are wells and springs that I am familiar with.

Henley well is ½ mile East of the city and ½ mile South of HWY 60. It is a new well and is in the 400 ft. range. It is 100 ft. North of the Henley Spring. In drilling this well it penetrated the stream from the Henley Spring. It was cased 80 ft.

Henley Well is free of nitrates, while Henley Spring tested 2.0 ppm. Bryant Well is in the 400 ft. range and free of nitrates. Bryant Spring tested 3.0 ppm nitrates. This spring and well are ½ mile East of the Henley Well. These tests were taken September 28, 1983.

On October 4, 1983 I tested the Keltner Spring and Well. The Keltner Well is in the Robidoux formation and is in the 600 ft. range. It is free of nitrates.

The Williams Vaughn Spring is near the Keltner Well and tested 3.4 ppm nitrate. This spring and well are ½ mile East of the Bryant well or on NN HWY ½ mile South of HWY 60.

Samuels Spring is 200 ft. North of Henley Well and is located in the Samuels Springs Addition. This addition has one acre lots. These houses all use septic tanks. The Cunningham well is the nearest well to Samuel Spring which tested 3.5 ppm nitrate. However, the Cunningham well is free of nitrates. It has 80 ft. of casing, and is in the 400 ft. range.

On October 13, 1983 I tested the Sequiota Spring and it had a nitrate content of 2.6 ppm. At that time I decided to experiment by testing the water at the lower end of the lake that the spring empties into. I found that the nitrate content had dropped to 2.2 ppm. I presumed that this was due to aireation.

The same day I tested the Jones Spring which is just East of the city limits on Catalpa St. and is a source of water for the city of Springfield. Jones Spring tested 3.3 ppm. Jones Spring is surrounded by some of the finest homes in this county and the valley that runs Eastward sloped toward the stream. One could not help but admire those lakes that follow one after the other. To my astonishment, the nitrate content drops to 1.8 ppm when it leaves the last lake on its way to Pierson Creek.

After the water reaches Pierson Creek, approximately 1 mile down stream it enters James River. Most of the time 100 head of Holstein cattle and 300 head of Angus cattle use this stream at will to drink. I was surprised to find that the water at the Blackman Intake only had a nitrate content of 1.8 ppm.

Across the road from the Blackman Intake I tested Don Bennet's well. It was also free of nitrates. By this time I was positive that the nitrates were dissipating into the silt or the black soil found in the lake bottoms and creek banks.

My findings caused me to test the Doling Park Spring and Lake on October 27, 1983. The spring tested 3.8 ppm and after the water had went through 10 sprinklers, I thought the water would dissipate itself of all of its nitrates if air had anything to do with it. The water tests 3.6 ppm as it leaves the lake.

Fulbright Spring has a nitrate content of 1 ppm. This is the best spring water that I tested. When I tested it on October 30, 1983, I also tested the water in the branch that runs along side of the Fulbright pump station. This branch heads up close to Hillcrest High School and picks up the run off of the zoo. To my surprise I found that this water in the branch was free of nitrates.

On November 4, 1983, the water in the Old Lime Quarry on HWY 13 that the city did empty its wastes from the water treatment plant into was found to have no nitrates in a sample taken from the surface.

My conclusions from these samples lead me to believe that the city of Springfield should dispense all spring water or water taken from subsurface sources into silt laden impoundments, preferable a series of these so that they might be drained out at intervals before it enters its treatment plants.

Water from the Turners Spring tested 5.8 ppm. The lake below had rid itself of nitrates. ¼ mile below the lake water in Turner Branch had a content of 6.2 ppm. I tested no well that had nitrate in it but I am confident that any well that has not had the subsurface water filtered out such as that used by the city would have a nitrate in it.

Records in the Department of Natural Resources show that the last testing done by that department was done in 1966.

Glenn E. Dillon
309 W. Kingsbury
Springfield, MO 65807

Nitrate Nitrogen Concentrations in Greene County Wells, Springs, and Surface Waters

(Summarized from a February 1, 1984
Report by G. E. Dillon)

Location	Date	Approximate Well Depth	Nitrate (mg/l)*
Henley Well, 1/2 mile SE of Springfield	09-28-83	400'	less than 1
Henley Spring	09-28-83	--	2.0
Bryant Well, 1 mile SE of Springfield	09-28-83	400'	less than 1
Bryant Spring	09-28-83	--	3.0
Keltner Well, 1.5 mile ESE of Springfield	10-04-83	600'	less than 1
Vaughn Spring	10-04-83	--	3.4
Cunningham Well, 1/2 mile SE of Springfield	10-04-83	400'	less than 1
Samuels Spring	10-04-83	--	3.5
Sequiota Spring	10-13-83	--	2.6
Exit from Sequiota Lake	10-13-83	--	2.2
Jones Spring	10-13-83	--	3.3
Jones Spring Cr. @ Pierson Creek	10-13-83	--	1.8
James River/Blackman Intake	10-13-83	--	1.0
Bennet Well	10-13-83	--	less than 1
Doling Park Spring	10-27-83	--	3.8
Doling Park Lake	10-27-83	--	3.6
Fulbright Spring	10-30-83	--	1.0
Fulbright Spring Branch	10-30-83	--	less than 1
Old Lime Quarry, N. Hwy 13	11-04-83	--	less than 1
Turners Spring	11-02-83 (lab rec'd)	--	5.8
Turners Lake	11-02-83 (lab rec'd)	--	less than 1
Turners Creek, 1/4 mile downstream from lake	11-02-83 (lab rec'd)		6.2

*Reported as nitrogen; the drinking water standard is 10 mg/l; analyses by Southwest Branch Laboratory, Missouri Division of Health.

U.S. Department of Housing and Urban Development
Kansas City Regional Office, Region VII
Professional Building
1103 Grand Avenue
Kansas City, Missouri 64106

March 7, 1984

Mr. Ed Vest
U. S. Environmental Protection Agency
324 East 11th Street
Kansas City, MO 64106

Dear Mr. Vest:

SUBJECT: Draft Environmental Impact Statement - Proposed Wastewater Treatment Facility; Green County, Missouri (February 1984)

This office has reviewed the subject Draft Environmental Impact Statement (EIS) for Greene County, Missouri. The document was found to be satisfactory in meeting the spirit and intent of the National Environmental Policy Act (NEPA) of 1969 and no apparent adverse impacts have been noted relating to Department of Housing and Urban Development projects in this jurisdiction. **W-2**

We appreciate the opportunity to comment on this matter.

Sincerely,

Lance Long

Lance Long
Environmental Officer
Office of Community Planning
and Development

RECEIVED
MAR 9
[illegible]04 BRANCH

CITY of SPRINGFIELD

March 14, 1984

Edward Vest, Chief
Environmental Impact Section
U.S. Environmental Protection Agency
Region VII
324 E. 11th Street
Kansas City, MO 64106

Re: Draft Environmental Impact Statement, Proposed Greene County Wastewater Treatment Facilities

Dear Mr. Vest:

During the public hearing on the draft E.I.S. on March 13, 1984, in Springfield, two individuals made comments regarding pollution from two landfills previously operated by the City of Springfield. These comments were negative in that they were attempting to show that constructing a new Northwest Wastewater Treatment Plant was not going to solve the water quality problem in the Little Sac River.

In that these statements were not made with the full knowledge of our proposed project, the City of Springfield wishes to provide further information. The design of the new Northwest Wastewater Treatment Plant is being performed by Burns & McDonnell, a consulting engineering firm working for the City of Springfield. The design has recognized that both Fulbright and Murray Landfills are potentially sources of pollutant loading to the stream. Since it is necessary to construct an interceptor sewer through both of these landfills a leachate collection system is also being provided as a part of this project to eliminate and/or minimize landfill pollutants entering the stream. The City of Springfield has also agreed to perform grading work and other remedial work to help alleviate this landfill problem. It is, therefore, the feeling of the City of Springfield that the construction of the Northwest Wastewater Treatment Plant and Interceptor will not only improve the water quality because of our improved wastewater treatment plant effluent, but also because pollutants from the landfill will be eliminated or certainly decreased to a drastic degree.

W-3

This information has been provided to both the Department of Natural Resources and to certain sections of your agency. It is hoped that the information contained in this letter will assist you in preparing a response to the negative comments received. If you require further information or clarification, please let me know.

Very truly yours,

Robert R Schaefer

Robert R. Schaefer, P.E.
Superintendent of Sanitary Services

RRS:cc
ccs: Randy Clarkson, M.D.N.R.
Tom Lorenz, U.S.E.P.A.

Department of Public Works
830 Boonville
Springfield, Missouri 65802
(417) 864-1900

March 20, 1984

Mr. Edward Vest, Chief
Environmental Impact Section
Region VII
324 East Eleventh St.
Kansas City, Mo. 64106

Dear Mr. Vest:

The comments on the accompanying pages concern the Draft Environmental Impact Statement for the proposed wastewater treatment facility in Greene County, Missouri. These comments are enclosed in the hopes that these observations can be used to improve the final EIS which is to follow.

Sincerely,

Steve Stettes

Steve Stettes
533 E. Monroe
Springfield, Mo. 65806

COMMENTS ON "The Proposed Wastewater Treatment Facility, Greene County, Missouri" Draft Environmental Impact Statement

Introduction page 12, sec. 3 Springs	The statement that "the Salem and Springfield Plateaus contain the world's greatest concentration of springs" is in error. While this area does exhibit many springs, the concentration cannot be expressed as the world's greatest.	**W-4**
page 18 & 19, sec. 4 Seismology	While correctly mentioning that "most of Missouri's earthquake activity has been concentrated in the southeast corner of the state, which lies within the New Madrid Seismic Zone," the statement fails to mention that the largest series and most powerful earthquake occurred in that area in 1811-1812. This would tend to give a different interpretation to the problem and it's impact on the Springfield area, and needs to be mentioned.	**W-5**
page 28, sec. B Water Resources	In speaking of the drainage divide in Greene County, the divide is listed as "roughly following the route of the St. Louis and San Francisco Railway." This railroad no longer exists and mention of this divide should be changed to following the route of the Burlington Northern Railway.	**W-6**
page 46, sec. 2 Groundwater paragraph no. 3	"Strategraphic" is misspelled and should be changed to "Stratigraphic."	**W-7**

page 49, sec. B Groundwater Movement	The 1974 study regarding the potentiometric surface in Springfield is outdated when compared to the amount of growth experienced since that time. Expanding development and recent well drilling and use have altered the potentiometric surface of the lower aquifer from what and where it existed in 1974.	**W-8**
page 80, sec. A Aquifers and Springs paragraph no. 2	Both a 1970 and 1974 survey are cited in reference to the number of private wells found to be contaminated. An indepth study was conducted for a thesis requirement by Mr. Bruce Bush, then a graduate student, at Southwest Missouri State University, in November, 1980, into the groundwater quality in unincorporated Greene County. This study offers some striking results and needs to be listed especially since it is more current that the two studies that are listed.	**W-9**
page 171, sec. A Municipal Treatment Facilities	Mention is once again made to the St. Louis-San Francisco Railway which no longer exists, and should be changed to refer to the Burlington Northern Railway.	**W-10**
Misc. Comments	1. The maps used in this draft statement should have been drawn onto or superimposed over topographic maps. This type of study is so closely linked to topographic constraints and the maps could better show this relationship if this method was used.	**W-11**
	2. No geologic map showing bedrock is incorporated into the report. This type of map needs to be included to help show those areas where the subsurface geology may affect the project.	**W-12**
	3. A more detailed physiographic map should be used rather that the more general regional map used on page 10.	**W-13**

March 21, 1984

Mr. Edward Vest
Chief of the Environmental Impact Section
Region VII
East Eleventh Street
Kansas City, MO 64106

Dear Mr. Vest

As a graduate student in Resource Planning at Southwest Missouri State University, I read the Draft Environmental Impact Statement on the proposed Wastewater Treatment Facilty, Greene Co. Missouri, with intrest. I hope you will find the enclosed comments useful in the preparation of the final EIS for the Wastewater Treatment plan.

Sincerely

Karen Entrup

Karen Entrup

COMMENTS ON "Proposed Wastewater Treatment Facility Greene County Missouri, Draft EIS."

General Comments

The length of the report should be reduced. I suggest greater use of referencing and scoping techniques. **W-14**

Environmental Setting

The maps presented in this section, and throughout the entire report, would be more accurate if they were constructed from a topographic base map. **W-15**

Characteristics of Planning Area Soils, page 27, figure 8

An engineering geology map showing geologic formations and engineering properties of soils in this area would better serve the purpose of this project. A map of this type would also reduce the need for the lengthy soil and geology descriptions included in the text. **W-16**

Atmosphere, page 26, figure 18

Because this study concerns the Springfield Area, wind data should be obtained from Springfield, not Kansas City. **W-17**

Specific Subarea Alternatives

Unincorporated Low Growth Subarea

Adoption of a on-site system management plan, as outlined in this report, is critical for maintaining water quality in this area. **W-18**

General Impact Assessment

Water Resources, page 313

Mitigative measures to minimize stream cross section changes should be described in greater detail. The measured discussed must be adopted in order to insure groundwater quality. **W-19**

Energy and Other Resources, page 341

This impact can be evaluated by considering construction energy costs, design life and operational energy of the new facility. The results of this evaluation can be presented in table form. The recovery techniques discussed should be implemented in order to reduce energy costs. **W-20**

March 21, 1984
1933 South Grant Apt. B
Springfield, Missouri

Mr. Edward Vest
Chief Environmental Impact Section
Region VII
East 11th Street
Kansas City, Missouri 64106

Dear Mr. Vest:

Enclosed are comments on the Draft Environmental Impact Statement for the proposed wastewater treatment facility in Greene County, Missouri. The objective of these comments is to add to areas of the impact statement that lack depth and to question important issues in order to gain feedback from the Environmental Protection Agency.

Sincerely,
Christopher J. Ives
Christopher J. Ives

Enclosure

COMMENTS ON "The Draft Environmental Impact Statement
for the Proposed Wastewater Treatment
Facility in Greene County, Missouri"

1. Maps on pages 17, 21, 29, 37, 47, 51, 53, 79, 85, 87, 143, 189, 195, and 203

Maps on the pages listed do not show important roads or landmarks within the city of Springfield. Battlefield Road, National Avenue, Grand Street and others are absent from these maps. Without more of these trafficways identified, location within Springfield is difficult. When these streets are added to each of the maps listed, detail assessment of the area will be possible. **W-21**

2. Page 167, line 33 and 34

The sentence should probably read as follows:
An 11-mile pipeline and other facilities constructed to link the Blackman Plant and Fellows Lake were completed in 1983. **W-22**

3. Page 169, lines 9, 10 and 11

What are the projected costs of pumping or hauling in new fresh water supplies if unrestricted growth contaminates the water supply? This estimation seems to be important when determining the cost/benefit of the project. Since a new source of fresh water will be needed by the mid 1990's, restrictions on wells and septic tanks seems mandatory. **W-23**

4. Relates to number 3

An economic assessment should be conducted on the affect construction will have on the local businessmen, i.e. farmers and ranchers. The cost of replacing water lost by development on all creeks and rivers should be accounted for in this impact statement. Specialists in farm management could make an unbiased decision to the proper amount of resources lost to development. The figures from this report should be included in the economic impact section of each of the subareas. **W-24**

5. Section II

The overall statement of Section II is one of the harmful impact of human expansion on the environment in Greene County. Are there any regulations for Greene County regulating or restricting growth in fragile environmental areas? If so, can these rules and regulations be used to maintain a liveable human environment? **W-25**

6. Page 336, lines 20, 21, 22, and 23

Will this project meet the deadline of September 30, 1984 for the Municipal Wastewater Facilities Construction Grants Program? **W-26**

7. Pages 336, 347 and 348

Industrial development should only be encouraged where industrial activity already exists. The Springfield Subarea's Southern System does not, at the present time, have any large concentrations of heavy industry. The alternatives for wastewater treatment in the Southern area are listed on pages 347 and 348 as having positive impact for industrial development. Is this to imply that this area can be considered for industrial development? **W-27**

8. Page 351 and 352, chart

Considering the community's financing ability is rated a -1 and that federal and state funds will be at a minimum for this project, is a general obligation bond the only potential method of financing this project? **W-28**

646 S. Wildon
Springfield, Mo. 65802
3-22-84

Edward Vest, Chief
Environmental Impact Section
Environmental Protection Agency
324 East Eleventh Street
Kansas City, Mo 64106

Enclosed are comments that I wish to submit regarding the Draft Environmental Impact Statement on the proposed Wastewater Treatment Facility, Greene County, Mo.

Shirley Gammon
Shirley Gammon

GENERAL COMMENTS

This EIS exceeds the page limitations adopted by the Council on Environmental Quality. Section 1502.7, in the regulations states that final EIS's shall normally not exceed 150 pages, or 300 pages for proposals of unusual scope or complexity. **W-29**

The organization could be improved in some areas. An example would be the brief, very general discussion of land use impact assessment under the heading of Land Use, page 342. The discussion found under Water Quality and Aquatic Ecology - Induced Growth (page 320), contains more detailed information on the effects of the proposed services on land use and the consequences of such land use change, yet it is in a rather obscure position in the text. **W-30**

UNINCORPORATED LOW GROWTH SUBAREAS

It is suitable and necessary to include methods of improving on-site sewage systems in a plan for comprehensive wastewater treatment facilities. Obviously, all parts of the planning area can not be handled by treatment plants, and on-site handling of wastes will continue. The EIS alternatives for these unserviced areas provides a basis for a management system for limiting the potential of groundwater pollution from these sources. I do feel that, since this is a comprehensive plan for Greene County, that federal funding should be contingent upon the adoption of such a regulatory system of on-site management by the County. W-31

LAND USE

As stated in the text (page 188, para. 2), EPA's official policy on the funding of sewerage facilities states, "Consistent with Agency cost-effectiveness guidelines, interceptors and collection systems should be located on agricultural land only if necessary to eliminate existing discharges and serve existing habitation."

I find it impossible to assess the effects of this proposal on the conversion and loss of agricultural land. I find the following shortcomings:

1.) page 185 - it is stated in regard to the chart shown that "Agricultural land and surface water in or near Springfield is tabulated as 'Vacant'." Was this to avoid defining the loss of and secondary effects on agricultural land? If not, what is the basis? What, exactly, is meant by 'in or near Springfield'?

2.) page 186 - defines the immediate Springfield vicinity as the area of the 1976 Springfield Traffic Zone Study, plus a ring of land about two or three miles wide around it. Does vicinity have the same meaning as 'in or near' on page 185. Again, I find the term, "... plus a ring of land about 2 or 3 miles wide ..." to be very non-specific. W-32

3.) page 192 - uses the Greene County Comprehensive Plan as a reference and states that, "Planned residential zoning in unincorporated parts of Greene County is to be restricted to an area within several miles of the Springfield city limits." This again is poorly specified, how many miles are several? Perhaps the inclusion of a map would solve this. W-33

4.) page 186, para 5 - "Even though most of the planning area's developed land is in the immediate Springfield vicinity, nearly 70% of the total land in that vicinity remains undeveloped." Again, exactly what is meant by vicinity? Also, the fact that 70% of land in the Springfield vicinity is undeveloped indicates to me that either a.) the vicinity, if that is meant to define the developable area, is of much greater size than is viable for a workable plan, or b.) development is to be on a sprawling, low-density basis, W-34 which is neither sound in regards to farm land preservation or in supplying sound facilities and services.

5.) A primary goal of wastewater treatment is the protection of the areas water supplies from pollution. Page 320, para. 1, states "The primary water-quality-related impacts from induced growth result from changes in land use patterns." It goes on to say that increased commercial and residential development will result, in part, from improved wastewater collection and treatment facilities. If this is the case, the impact of land use changes should be evaluated more thoroughly in this EIS. **W-35**

6.) The fact that the Greene County Comprehensive Plan downplays the importance of agricultural land illustrates the concept that while agricultural land preservation may not be deemed critical or even desirable at the local level, the cumulative conversions resulting from this attitude will have significant effects at the national level. As the federal entity involved in the plan, I feel that the EPA should be considering the loss of agricultural land due to induced development in more detail. **W-36**

CONSTRUCTION-RELATED IMPACTS

1.) Knowledge of cave-dwelling species

is severely limited. Thus, in addition to precautions taken to lessen the amount of siltation, care should be taken in the blasting, so that underground cave or karst areas are avoided. **W-37**

2.) The management, for areas disturbed and cleared in construction, is to allow it to go back through successional stages to the climax stage. Where is the enforcement to insure that this is done? Who is responsible? **W-38**

Stanley Huck
1722 W. Catalpa
Springfield, MO
65807

March 22,1984

Mr. Edward Vest
Cheif, Environmental Impact Section
United States Environmental Protection Agency
Region VII
324 East Eleventh Street
Kansas City, MO 64106

Dear Mr. Vest,

The preparers of this Draft EIS did a good job of covering the environmental impact of the planning area. There is no doubt that Greene County is in need of a new wastewater facility plan because of the unsuccessful attempt of the present facilities to handle wastewater treatment.

The proposed plan of action for each subarea appears to be the best course of action considering the sensitivity of the planning area and other available alternatives.

Inclosed are some comments on the Draft Environmental Impact Statement for the Proposed Wastewater Treatment Facility Greene County, Missouri.

Sincerely,

Stanley Huck

Stanley Huck

COMMENTS ON: The Draft Environmental Impact Statement
Proposed Wastewater Treatment Facility
Greene County, Missouri.

General Comment	The length of this statement exceeds the recommended length set forth in the guidelines of NEPA section 1502.7. Incorporation by reference and tiering could have been used more to decrease the length of this statement.	W-39
Unincorporated Low Growth Subareas. Section 4, page 305	These areas are severed mainly by septic tanks and other on-site desposal systems. In part (4) of this section goals of the plan are listed. These are very good on-site system management goals. The problem lies in the inforcement an implementation of the goals. Newly constructed systems can be monitored during construction for sound design and construction practices. But what can be done about existing systems to insure proper maintance and to reduce the amount of harmful discharge into the groundwater system? Who will be responsible for monitoring these on-site systems?	W-40
Geology and Soils Page 308 Paragraph 2	This section of the report mentions blacting of the bedrock for excavation purposed. It is apparent that in some locations this can not be avoided. In these areas careful and through evaluation of the subsurface geology is in order. Blasting in areas where shallow caves exist could cause a collapse, thus clogging the subsurface drainage system in that area.	W-41

Geology and Soils
Mitgative Measures
Page 311
Paragraph 2

In this section it is stated that construction across sinkholes and loosing portions of streams will be avoided if feasible. If this is not feasible then these features will be sealed. It was also ststed earlier in this report that sealing of sinkholes may disrupt the natural drainage and increase flooding in adjacent areas. What measures will be incorporated to insure that these areas will not be adversly affected? Considering how fragile the groundwater system is in the planning area, sinkholes and loosing portions of streams should be avoided at all costs. **W-42**

March 22, 1984

Mr. Edward Vest
U.S. Environmental Protection Agency
Region VII
324 East Eleventh St.
Kansas City, Missouri 64106

Dear Mr. Vest:

Following are some comments on the draft EIS for the proposed Greene County Wastewater Treatment Facility. I hope these observations will be beneficial in preparing the final EIS to follow.

	This document is valuable in recognizing the distinct geologic qualities of Greene County and their importance in maintaining water quality.	**W-43**
Water Quality and Aquatic Ecology page 67 table 7	Your existing water quality data is more then 6 years old. Data of this type may be obtained through limited field work.	**W-44**
General Impact Assessment page 319 last ¶	You state that minor benefits in water quality and aquatic ecology occur as a result of increased base flow in streams receiving discharge. It should be mentioned that evaluating data on low flow and low + effluent flow is necessary to determine any beneficial or detrimental effects on water quality and aquatic ecology with increased base flow.	**W-45**
page sect. 3	It should be noted that impact from sewage bypass during storm runoff is minor, but can be severe in areas where discharge to losing steams and other karst features occur.	**W-46**
	The Fair Grove Subarea is a sensitive area because of its poor alternatives. Storm bypass and facility overflow are most potentially harmful. The intermittent character of the discharge streams make the land application alternative with its storage basin an ecologically more efficient alternative.	**W-47**

Joel C. Keller

RECEIVED
APR 0 2 1984
ENV SECTION

Gary W. Krizanich
1848 S. Maryland
Springfield, MO 65807

March 22, 1984

Mr. Edward Vest
Chief Environmental Impact Section
Region VII
East 11th Street
Kansas City, MO 64106

Dear Mr. Vest:

Attached are comments pertaining to the Draft Environmental Impact Statement for the Proposed Wastewater Treatment Facility, Greene County, Missouri.

Sincerely,

Gary W. Krizanich

Gary W. Krizanich

llm
Attachments

First, I must commend your agency on its selection of proposed alternatives which would minimize the number of direct discharge sites for effluent. However, this plan is written for areas which are unsewered at present. Your choice of alternatives is based on a presumption of community participation in the construction of sewerage facilities. Based on information in Tables 41 and 42 concerning user charges for these facilities, it would seem unlikely that construction of these new facilities would be approved by community residents. **W-48**

Page 175 Paragraph 3

During the period from 1979 to mid-1982, fecal coliform at the Southwest plant were above the prescribed limit 11 percent of the time. Further, it is stated on page 65 that "Phosphate, which is not removed by the Southwest plant, is still present at high levels in the James River downstream of its confluence with Wilsons Creek, as is nitrate, a treatment process by-product." There is a discussion on page 93 of methemoglobinemia "a serious and sometimes fatal poisoning in infants" caused by excess nitrates in drinking water. Phosphates can cause an acceleration of the natural aging process of lakes which may have a profound impact on communities surrounding the planning area. By discharging these substances into the James River, there is a potential for pollution of downstream water supplies. While there is some discussion in the draft impact statement of upgrading facilities, it would seem that for the present, the pumping of sewage to the Southwest plant from three additional **W-49** communities in the planning area (Battlefield, Brookline and Strafford) would only compound these problems. The discharge of effluent, no matter how high quality, into a stream will have a significant impact on that stream's environment.

Page 193 Paragraph 3

Although plans for the new Northwest treatment site call for building on a site not previously used for landfill, a potentially hazardous situation exists at this site. "Sampling of the Murray and Fulbright sites indicates significant oxygen demanding pollutants; cyanide was found at levels possibly toxic to aquatic life and two organic priority pollutants were also detected." Any spills in this area could result in possible migration of these pollutants. **W-50**

Page 311 Paragraph 2

Avoidance of sinkholes during the construction phase must be accomplished. The potential for sinkhole collapse and groundwater pollution is too great over most of the planning area. Sinkhole sealing is unacceptable in this area. Aley and Thomson (1981, p. 1) in their report on the hydrogeology of unincorporated Greene County discuss sinkhole filling: **W-51**

> "Such sinkhole modification is not in the long-range interest of the people of Greene County. If only the drainage points or a portion of the sinkhole is filled, then flooding within the remainder of a sinkhole is likely to become a more serious problem. If the sinkhole is completely filled and waters are diverted to adjacent sinkholes, then flooding problems in the adjacent sinkholes are likely to become more

severe. Furthermore, subsidence and sinkhole collapse are more likely to occur in sinkhole areas which have been subjected to filling than in undisturbed areas."

The following is a list of typographic errors encountered in reading of the statement.

W-52

Page		
xv	Figure 8 title	septic
45	Para 3 line 4	artificially
46	Para 3 line 3	stratigraphic
59	Para 2 line 6	sufficient
84	Para 1 line 7	significance
311	Para 5 line 1	beneficial
314	Para 1 line 3	accidental

Reference Cited:

Aley, T. and Thomson, K.C., 1981, Hydrogeologic mapping of unincorporated Greene County, Missouri, to identify areas where sinkhole flooding and serious groundwater contamination could result from land development, Ozarks Underground Laboratory, Protem, Missouri.

Wendell L. Barner
Southwest Missouri State University
Department of Geography and Geology
Box 87
901 S. National
Springfield, Missouri 65804-0089

March 23,1984

Mr. Edward Vest
Chief Environmental Impact Section
United States Environmental Protection Agency
Region VII
324 East Eleventh Street
Kansas City, Missouri 64106

Dear Mr. Vest;

I have reviewed the Draft Environmental Impact Statement for the proposed Wastewater Treatment Facility in Greene County, Missouri and would like to make the following comments and pose the following questions in hopes that they will be reviewed and considered in the Final Environmental Inpact Statement.

On page 12, line 3 of the EIS it is stated that the "Salem and Springfield Plateaus contain the world's largest concentration of Springs." This seems to be exaggerated somewhat and should be read to say that the Missouri Ozarks contain one of the nation's greatest concentration of Springs (see Springs of Missouri, DNR publication, 1982, p. 3). W-53

On page 16 the description given in the text concerning the trends of some major faults in the area do not match the figure. According to the figure, Graydon Springs fault trends more east-west and is in the northern part of the county while Valley Mills fault trends east-west to the northeast of Springfield and trends northwest-southeast to the east of Springfield. W-54

Also, on page 16 you have a section on seismology. I feel you fail to consider the importance of seismology in the area. It's true that most of the earthquake activity is in the southeastern portion of the state however due to the continuous bedrock geology in Missouri, the propogation of shock waves from a major earthquake will be felt statewide. I'm concerned that a major earthquake may cause structural damage in this area which could pose a threat to our water quality if wastewater facilities cannot withstand the stresses from the attenuation of shockwaves. W-55

The Mercalli scale is used in this text to describe the intensity of an earthquake. This scale is based upon human reaction to different intensities of an earthquake and is unacceptable as a scientific means of evaluating earthquake intensities. The reaction of people will differ nationwide as well as worldwide due to changing geologic conditions and the individuality of people.

Page 46, paragraph 4, line 3, the word strategraphic should be spelled stratigraphic. W-56

Page 46, paragraph 3, line 4, the term "shelfstone" is used in describing part of the Northview formation. I'm not familiar with this term and have been unable to find it in any modern geologic literature. Could you please define this term or choose a more appropriate term? W-57

On page 26, figure 18 gives wind data from Kansas City adjusted for Springfield. I'm sure this information can be obtained from the National Weather Service in Springfield rather than using Kansas City data. I would suggest using the data for this area and not use the information from areas outside the study area. W-58

Paragraph 4 on page 307 states that "blasting and rock drilling may be required when sewer lines are routed across rocky area." I'm concerned about this since you have not indicated any site studies, particularly geophysical studies to insure blasting won't occur over a sink hole of underground cavern system. I hope you will answer as to whether any studies have been undertaken to look at this aspect. I'm sure there are areas that require blasting, however, these areas should be studied to determine whether or not they are suited to this type of action. In addition I would like to know what type of site studies, if any, have been used to determine site suitablility. W-59

Page 311. paragraph 2, states the possibility that sinkholes and losing streams may be filled if it is unfeasible to construct around them. I feel this is an inadequate mitigating action since filling in sinkholes or losing streams will affect the drainage in the area. On page 20, the last sentence states that "filling in a cave could disrupt subsurface drainage systems." Are you impling that filling in a sinkhole or losing stream will not cause the same problem? I sincerely hope this mitigation is not considered since there is no guarentee that filling in sinkholes and losing streams will solve any problem except to disrupt surface and subsurface drainage in the area. You have also failed to consider any short or long term affects of this action. Why is this? **W-60**

One of the proposed plans is to expand the Southwest Treatment Plant. Will this expansion of this facility be able to meet and exceed future demands upon the system and meet discharge requirements or will the system still remain unable to meet discharge requirements due to problems within the system and during periods of high water inflow? **W-61**

In preparing maps it would be extremely beneficial to use a topographic base map so the reader can easily associate proposed facilities with the location of existing cultural and physical features. In addition, using the overlay technique would be beneficial in determining problems within the location of the proposed facilities and sewer lines. Examples might include overlaying the proposed facilities on a detailed soils map or bedrock geology map which was not included in the DEIS. **W-62**

I would find it extremely helpful if a bedrock geology map was provided in this text. The geology and the geologic conditions in this area are extremely important in the determination of site suitability of the proposed facilities and this information should be provided instead of a general discription of the geology in the area. **W-63**

A generalized soils map is provided in this text, yet with the problems of the soils in this area no engineering data such as the limitation of soils is provided. I would suggest that this information be included in the Final Impact Statement. **W-64**

The overall quality of the maps in this DEIS are extremely poor. There is no excuse for such poor draftsmanship in the preparation of these figures. This is not professional work. **W-65**

Section 1500.4 of the CEQ guidelines calls for reducing paperwork in various ways. Page limits are established for final EIS to normally be less than 150 pages and under unusual scope of complexity shall normally be less than 300 pages (1502.7 of CEQ guidelines). This Impact Statement is extremely encyclopedic and certain requirements in the CEQ guidelines should be used to reduce bulk of this text. If the preparers feel that the information in this DEIS is pertinant to the project, then they should look at Section 1502.21 of the CEQ guidelines which states "agencies shall incorporate material into an environmental impact statement by reference when the effect will be to cut down on bulk without impeding agency and public review of the action" (CEQ guidelines, p.13). **W-66**

On page 51, a potentiometric map based on data that is ten years old. In ten years there has been a tremendous amount of growth and change in the city of Springfield as well as in the **W-67** county. I feel this information needs to be updated to some degree, maybe not a complete study, but new information needs to be obtained.

The last comment I would like to make refers to researching areas with similar geologic conditions and problems. I feel this would help determine what actions should be evaluated and proposed to eliminate problems and unnecessary mitigations.

W-68

In conclusion, I agree that there is a need for the proposed Greene County Wastewater Treatment Facilities and I agree with the proposed plan for the area, however, I hope the proceeding comments and questions are considered and answered.

Sincerely yours

Wendell L. Barner

Wendell L. Barner

March 23, 1984

Mr. Edward Vest
Chief Environmental Impact Section
Region VII
East 11th Street
Kansas City, Missouri 64106

Dear Mr. Vest:

Enclosed are comments on the Draft Environmental Impact Statement for the Proposed Wastewater Treatment Facility for Greene County, Missouri.

Sincerely,

Drew M. Holt

Drew M. Holt

Enclosure

COMMENTS ON
"Draft EIS on Proposed Wastewater Treatment Facility, Greene County, Missouri"

Government and Community Services
pp 338-341

There are many governmental jurisdictions involved in the design, planning and implementation of the proposed project. The actual location of interceptors will practically determine future growth patterns in Greene County. **W-69**

As the project progresses, coordination and cooperation between and within the various levels of governments will be extremely important. Future planning efforts and efficient administration of community services in a growing Greene County will be enhanced by coordinated efforts now. **W-70**

Solid Waste
p 343

In the Draft EIS reference is made to the "Facilities Plan" for analyses of alternatives' cost-effectiveness regarding sludge processing and disposal. However, the Final Facilities Plan has only recently been completed and has not yet been distributed. **W-71**

The use of the term "land application" in referring to sludge processing and disposal results in confusion as "land application" throughout the remainder of the Draft EIS refers to an alternative method of wastewater treatment and disposal. **W-72**

Fair Grove Subarea
pp 263-264

In the discussion of the Fair Grove Subarea, sufficient comparative cost information on the Land Application alternative seems lacking. **W-73**

Why is Land Application not a more practical alternative in the Fair Grove Subarea specifically and in Greene County in general?

Has there been any public opposition to this alternative?

W-74

I have no personal problem with the proposed alternatives. I believe that much effort has been made to thoroughly examine each alternative and to select the most appropriate ones. However, the Draft EIS has lacked clear and concise information with regard to the Land Application alternative. More clear and concise information on this subject might have reduced some of the misgivings expressed at the Public Hearing on March 13 and allowed the public to make more informed decisions.

March 23, 1984

Edward Vest
Chief Environment Impact Section
Region VII
East 11th St.
Kansas City, MO 64106

Dear Sir,

The enclosed comments on the Draft Environmental Impact Statement, Proposed Wastewater Treatment Facility Greene County, Missouri, are offered in the hopes that some of these observations will improve the document.

Sincerely,

Mark T. Premont

COMMENTS ON "DRAFT ENVIRONMENTAL IMPACT STATEMENT PROPOSED WASTEWATER TREAT
M

COMMENTS ON "DRAFT ENVIRONMENTAL IMPACT STATEMENT
PROPOSED WASTEWATER TREATMENT FACILITY GREENE COUNTY, MISSOURI"

1. THE SUMMARY SPENDS TOO MUCH TIME ON THE CURRENT SITUATION AND ALMOST NO TIME ON THE IMPACT OF THE PROJECT. OF THE 5 PAGES OF TEXT IN THE SUMMARY ONLY ONE PAGE SPEAKS TO THE IMPACTS OF THE PROJECT, AND THEN ONLY IN VERY BROAD TERMS. **W-75**

2. MANY OF THE CHARTS USED IN THE DOCUMENT ARE EXCELLENT BUT COULD HAVE BEEN PLACED IN THE APPENDICES TO REDUCE THE LENGTH OF THE EIS TO THE REQUIRED LENGTH. **W-76**

3. THE POPULATION DISCUSSION STARTING ON PAGE 146 IS EXCELLENT AS FAR AS WHAT IS THE CURRENT POPULATION BUT LEAVES MUCH TO BE DESIRED ON WHAT THE FUTURE WILL BE. TWO BETTER METHODS COULD HAVE BEEN USED TO DEVELOPE THE FUTURE POPULATION. ONE METHOD WOULD BE TO FIND A AREA THAT HAS GONE THROUGH SIMILAR DEVELOPEMENT AND MODIFY THE POPULATION TO FIT THIS AREA. ANOTHER METHOD WOULD BE TO USE A SET GROWTH AND RECOMMEND THAT RULES GOVERNING GROWTH BE ESTABLISHED TO FIT THE LIMITS USED. TO USE THE ASSUMPTION THAT WHAT HAPPENED IN THE PAST WILL HAPPEN AGAIN IS A POOR ASSUMPTION. **W-77**

4. THE ECONOMICS AND FINANCING DISCUSSION SHOULD HAVE SOMETHING ABOUT THE PROBABILITY OF PASSING THE REQUIRED BONDS NEEDED TO FINANCE THE PROJECTS. THE CHANCE OF PASSING THE BONDS IN VIEW OF PAST BOND ATTEMPTS SEEM SLIM IF NOT IMPOSSIBLE. **W-78**

5. THE MAPS IN THIS DOCUMENT ARE SOME OF THE POOREST MAPS OF THE EFFECTED AREA THAT HAVE BEEN VIEWED. THEY TEND TO CONFUSE THE INFORMATION NOT CLARIFY IT AS A GOOD MAP NOULD.

6. THE MAPS OF THE AREA COULD BE MUCH BETTER IF THEY WERE DRAWN FROM SCATCH WITH THIS DOCUMENT IN MIND. **W-79**

7. TABLE 37 OF THE REPUBLIC SUBAREA ON PAGE 266 SHOULD HAVE ANOTHER COLUMN WITH THE TOTAL ANNUAL EQUIVALENT COST WITH FEDERAL AND STATE GRANTS. **W-80**

8. THE POPULATION IMPACT DISCUSSION ON PAGE 334 AND 335 SHOULD SPEAK TO THE AFFECT OF AN 800 DOLLAR SEWER BILL ON GROWTH TO AN AREA. THIS KIND OF SEWER BILL WOULD HAVE A STRONG EFFCT ON NEW RESIDENTS. **W-81**

Reproduced from best available copy.

United States Department of the Interior
OFFICE OF ENVIRONMENTAL PROJECT REVIEW
175 WEST JACKSON BOULEVARD
CHICAGO, ILLINOIS 60604

ER-84/224

March 23, 1984

RECEIVED
MAR 27
S/40 [illegible] NCH

Mr. Morris Kay
Regional Administrator
United States Environmental Protection Agency
324 East Eleventh Street
Kansas City, Missouri 64106

Dear Mr. Kay:

The Department of Interior has reviewed the Draft Environmental Impact Statement (DEIS) for Proposed Wastewater Treatment Facilities, Greene County, Missouri. Consolidated Departmental comments are provided for your consideration during future planning for the proposed project.

General Comments

The Bureau of Mines reviewed the subject document for impact on mineral resources and mining activity. The proposed action will have no adverse impact on minerals or mining; they have no objection to the proposal or the DEIS as written. W-82

Park and recreational resources in Greene County are not mentioned in the draft statement; nor are impacts on these resources due to the proposed project facilities or related construction activities indicated. The final environmental statement should provide a descriptive analysis of all park and recreational resources in the county and the project's impacts on them. Measures to avoid or minimize harm to these resources should be described.

Fair Grove Mound Park, which has received matching funding assistance from the Land and Water Conservation Fund (LWCF), may be impacted by Alternate C-2-A as shown in Figure 41 on page 261. If the project will use any land from this or any other area which has received LWCF assistance, compliance with Section 6(f) of the LWCF Act, as amended, must be accomplished. W-83

Section 6(f) provides that no property acquired or developed with assistance under this section shall, without the approval of the Secretary of the Interior, be converted to other than public outdoor recreation uses. It also requires the substitution of converted lands with other recreation properties of at least equal fair market value and of reasonably equivalent usefulness and location. The National Park Service is designated by the Secretary of the Interior to consider approval of Section 6(f) conversion requests upon submission through the State Liaison Officer for Outdoor Recreation. In Missouri this official is Mr. Fred A. Lafser, Director, Department of Natural Resources, P. O. Box 176, Jefferson City, Missouri 65102.

The draft describes the cultural resources in Greene County and discusses general impacts and mitigative measures, but does not note any coordination with the Missouri State Historic Preservation Officer (SHPO), who is also Mr. Fred A. Lafser. The final statement should evidence the approval by the SHPO of the completion of compliance by the Environmental Protection Agency with all mandates pertaining to the identification and protection of cultural resources. W-84

The DEIS adequately describes wildlife resources within the project area. In qualitative terms, general impacts to those resources and potential mitigative measures were also presented. Because impacts were described in qualitative terms, comparison of alternatives was difficult to conduct. Additional quantitative information, such as acres of bottomland forests cleared and number of stream crossings, for each alternative would aid in comparison of the alternatives. Once such impacts are quantified, appropriate mitigative measures can be more readily determined. W-85

To facilitate compliance with Section 7(c) of the Endangered Species Act of 1973, as amended, Federal agencies are required to obtain from the Fish and Wildlife Service information concerning any species, listed or proposed to be listed, which may be present in the area of a proposed action. Therefore, we are furnishing you the following list of species which may be present in the concerned area:

Endangered

Bald eagle	Haliaeetus leucocephalus
Gray bat	Myotis grisescens

W-86

The draft statement indicates that no caves will be directly impacted by project implementation. Although bottomland forests will be cleared with project construction, it is unlikely that potential perch or roost sites for the bald eagle will be affected since these bottomland forests do not occur near suitable food sources. Therefore, the project is unlikely to affect the bald eagle or gray bat.

This precludes the need for further action on this project as required under Section 7 of the Endangered Species Act of 1973, as amended. Should this project be modified or new information indicates endangered species may be affected, consultation should be reinitiated.

Specific Comments

Page 324, paragraph 1 - This paragraph states that contaminant-induced impacts may warrant special consideration. An increased level of plant nutrients is identified as one of the contaminant-induced impacts. Two mitigative measures are defined (specific treatment processes and wastewater treatment with land application); however, the measures were found to be either too costly or impractical. No practical measures were identified, therefore, will these impacts go unmitigated? W-87

Page 324, paragraph 2 - Wastewater disinfected with chlorine was identified as the second contaminant-induced impact warranting special consideration. The draft statement indicates that wastewater treatment plants (WWTP) discharging disinfected effluent into the Little Sac River or the Pomme de Terre River basins should include measures to mitigate for adverse impacts associated with chlorine disinfection in order to reduce water-quality-related impacts to the Niangua darter and other aquatic life. No allowance is made for mitigating similar impacts from WWTP's discharging into other river basins. W-88

Page 330, paragraph 2 - 6. Mitigative Measures - This paragraph describes mitigative measures for the loss of bottomland forests. The measures involve grading of the right-of-way with natural revegetation and time of year construction constraints. We are particularly concerned with the loss of bottomland forests and the mitigative measures outlined in the draft environmental statement. Depending upon the amount of bottomland forest permanently lost by project implementation, (i.e. from plant sitings, etc.) natural revegetation in areas disturbed by interceptor line placement may not be sufficient to offset losses. However, such a determination as to the appropriate mitigative measures cannot be derived from the information provided in the statement. As a minimum, and as outlined on page 380, interceptor lines should be aligned to avoid, to the extent practicable, impacts to the bottomland forests. These corridors should be initially revegetated with native grasses and forbs to stabilize the disturbed soils and reduce the potential for erosion and sedimentation. W-89

Sincerely yours,

Sheila Minor Huff

Sheila Minor Huff
Regional Environmental Officer

5133 N. Old Highway 13
Springfield, MO 65803
March 23, 1984

Mr. Edward Vest, Chief
Environmental Impact Section
Environmental Protection Agency
324 E. 11th Street
Kansas City, MO 64106

RE: EIS Statement, Greene County, Missouri
Proposed Wastewater Treatment Facilities

Dear Mr. Vest:

I have reviewed the statement presented and attended the public meeting held March 13 in Springfield, Missouri.

I would like to add a commentary to the information and ask why certain areas were not treated in the study, and why those discussed, were in some cases, treated in a minimal fashion.

I have contacted a number of state agencies regarding the water problem on our family farm: Conservation, DNR, Missouri state geologist, Missouri Clean Water Commission.

The farm on which we live has been in our family without any change of hands since my great grandfather settled there in 1867. He settled there because he was impressed with the water supply--the springs and streams which were on the land.

The family farmed this land after his death and it was passed down to my father. In 1929 the rape of the land began. The Springfield City Water company condemned part of the land for what is now McDaniel Lake. My father was paid the grand total of $2500 for his land, reparian rights and any damages to the property. The appointed commissioners who judged the damage evidently felt that there was little damage as they stated in the proceedings (as stated in the abstract) that there would always be water on the farm, due to the large springs and the fact that water would be flowing from McDaniel Lake into the stream in an orderly fashion except in times of flood.

In the 1950's we noticed that something was going wrong. Fellows Lake was built just north of McDaniel Lake and the drought of the 50's caused City Utilities to drill additional deep wells in the area of the lake. The water table was lowered as we had to drill a deeper well; many of our neighbors also did the same. Since that time, there has been a decrease of water in the stream. Each year there has been less water in the stream as City Utilities has impounded more water.

My husband and I built a new home on the property in 1977 and we have observed what has happened since then. The summer of 1983 was not classified as a drought year and yet no water was released from McDaniel Lake during the summer months and the only water in the river was what had been trapped in small pools. Earlier in the spring when water was flowing, fish had come over the dam. They were left trapped in the pools to die in the stagnant water. We reported this to the Conservation Commission who wrote to the City Utilities. There was no response from CU and no water was allowed in the river.

It seems that City Utilities has the best of two worlds--they are able to hold the water back as long as they need it, but when rainfall occurs and they have flooding and run-off upstream, they suddenly release the water. Because a continuing stream channel has not been maintained, our lands are flooded.

We have been denied a water supply by City Utilities and now the City of Springfield enters the picture.

We have had water in the South Dry Sac River, although it was badly contaminated by effluent from the Northwest Treatment Plant. It is impossible to complain about having effluent removed from the river. We have complained many times about the odor and condition of the water, particularly since Litton Industries and the airport industrial area were put on the Northwest Plant. However, when the trunk line is built and the effluent is diverted down that line, and the City Utilities continues to hold back water at the Fulbright Spring area, we will have very little water left in that river.

We realize the quality of water will be improved down stream once the new treatment plant is working, but we are concerned IF there will be water coming down the river.

In discussing the easement crossing our property, Mr. Schaefer, from City of Springfield brought up another concern.

The Fulbright landfill has been leaching into the river since it was built. The city intends to take the liquids out of the Fulbright landfill, treat the liquid, and put down the stream before the new treatment plant is built. Then the city proposes to purchase a temporary easement across our property to pass the liquids from the Murray landfill to the old plant for treatment and then down the river.

If we have a Northwest Treatment plant which is already overloaded and inadequate to handle the waste which is now being placed in it, how can it handle safely the hazardous wastes from the Fulbright and Murray landfills? If this occurs during the summer of 1984, we are going to have even more contamination in this river.

Our farm with both Sac Rivers running through it, is an area where many people from Springfield come to picnic and fish, where wildlife are plentiful, with blue heron living down stream only a short distance. How will the wildlife, the public, the residents be protected?

I fail to understand how EPA can give permission for the construction of the new Northwest Treatment Plant when no statement has been given from City of Springfield on how this waste matter is to be treated and how the public will be protected.

In the EIS I noticed one reference from DNR regarding waste materials which are in both landfills, but since so little was said about the types of wastes, I can only assume that you are not too sure what is located in those landfills.

As I said, in the beginning of this letter, we have two concerns: will we have water crossing our farm and will we and the public be protected from transportation of hazardous wastes as the water or liquid in the temporary pipes crosses the property or is disposed in the Sac River. **W-90**

I did not feel that the condition of the decreased water supplies and possible contamination problems were addressed in depth in the Environmental Impact Statement and I am asking for your response.

Sincerely,

Helen Murray White

Helen Murray White

Springfield MO
Mar 25-1984

United States Envoromental Protection agency
324 E. 11st St
Kansas city MO
att. Edward Vest

Dear sir.

Since I was in the water well busines over 35 yrs I would like to draw your attention to page 49 of the Draft Enviormental Impact Statement.

This States that most residental + Farm wells are drilled to about 300 ft.

This is a gross misjudgement, If that were the case 90° of them would not have water in them or would not have enough water in them to maintain a home or farm.

An average depth of 400 ft would be more realistic.

W-91

Drillers in this area once sent in samples to Rolla when they drilled a well but the time spent taking samples was not recoverd by the pay they got.

My word on this subject can be Verified by calling 881.1784-Hewitt Drilling Co 881 0003 Beck Drilling co - 881 9319 Shelton Drilling Co or 882 6464 Southwest Drilling Co.

Glenn E Dillon
309 W. Kingsbury
[illegible] MO 65

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RECEIVED
APR 0 2 1984
ENV SECTION

May 20, 1984

Mr. Edward Vest
Cheif, Environmental Impact Section
U.S. E.P.A. Region VII
324 East Eleventh Street
Kansas City, Missouri - 64106

Dear Mr. Vest

Please find enclosed a short list of Comments relateing to the Draft E.I.S. of the Proposed Wastewater Treatment Facility, Greene County, Missouri.

Thankyou
Craig Skinner

Comments

1. The Final E.I.S. is, according to section 1502.7 "shall normally be less than 150 pages, and for proposals of unusual scope or complexity shall normally be less than 300 pages." Even if we are to assume this to be a project of unusual scope, the Final EIS will need to be cut some 81+ pages to comply. **W-92**

2. In Section 1500.4 Reducing paperwork by (c) "Discussing only briefly issues other than significant ones (§ 1502.2 (b))." Such a section which would seemingly stretch an interpretable ruling as this is D. Terrestrial Ecology starting on page 101 of the Draft EIS. Could not some of this be simply referenced or placed in the appendix **W-93**

Responses to Written Comments

W-1. The additional and more current ground water quality data presented underscore the need for the proposed projects in Greene County. Increased nitrate concentrations may indicate contamination by excessive or poorly timed nitrate fertilizer applications or livestock operations, as well as domestic wastewater. Other water quality parameters, such as fecal coliform and fecal streptococcus bacteria and chloride, can be analyzed to better indicate the source(s) of contamination. Nitrate concentrations are often reduced as a stream flows through an impoundment because of algal uptake of plant nutrients, which include nitrate.

W-2. Comment noted.

W-3. Comment noted.

W-4. A corresponding revision to the Draft EIS is noted in Section III of the Final EIS.

W-5. Mention of the New Madrid earthquakes of 1811-1812 is primarily of historical interest. Design and construction practices relate to the Seismic Risk Map of the U.S., referenced by the BOCA* Basic National Building Code and AASHTO** Standards. The Draft EIS covers seismic risk satisfactorily for design and the general public. The risk zone, acceleration, and intensity are taken from the risk map. Three epicenters near the study area are also identified.

W-6. A corresponding revision to the Draft EIS is noted in Section III of the Final EIS.

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* Building Officials and Code Administrators International, Inc.
** American Association of State Highway and Transportation Officials

W-7. A corresponding revision to the Draft EIS is noted in Section III of the Final EIS.

W-8. It is true that potentiometric surface data remains valid for only a short time, particularly in areas of urban growth. Unless a specific study has been made, a potentiometric map is usually not available. The 1974 study (published in 1978) is the most recent known to be available for the planning area. The MDNR Division of Geology and Land Survey does not have updated information to revise the map, and updating the map is not within the scope of this EIS study.

W-9. Corresponding revisions to the Draft EIS are noted in Section III of the Final EIS. The study findings by Mr. Bush were consistent with the information presented in the Draft EIS.

W-10. A corresponding revision to the Draft EIS is noted in Section III of the Final EIS.

W-11. Topographic base maps are often helpful, but were not used for the Greene County EIS because of the scale required to cover the planning area, the reader audience, and budget and schedule constraints. To provide meaningful detail, a topographic map scale of one-half that of quadrangle sheets would be needed. This would result in a planning area map size of about 28" x 40", which is impractical for this EIS. The Draft EIS utilized maps from the Facilities Plan to illustrate subarea alternatives. Because of schedule and budget constraints, the production of different or improved subarea maps for the EIS was not efficient or justified. Topographic maps were used in assessing environmental impacts of the alternatives.

W-12. A bedrock map of the planning area would be of limited usefulness because of the availability of specific engineering geologic reports at the alternative waste disposal sites, and the scale required to cover the planning area. The site investigations were conducted by the MDNR Division of Geology and Land Survey and the site reports for each subarea are included in the final Facilities Plan. Also, to provide meaningful detail, a bedrock map scale of one-half that of quadrangle sheets would be needed. This would result in a planning area map size of about 28" x 40", which is impractical for this EIS.

W-13. Figure 2 shows the regional physiography of the planning area in the context of the physiography of the State of Missouri and immediately adjacent areas of other states. The physiographic divisions within Missouri are those shown in MDNR Division of Geology and Land Survey publications. Where local physiography is significant to specific project alternatives, this has been indicated in other portions of the Draft EIS. Further detail on physiographic maps of the overall planning area would be of little additional value.

W-14. The Greene County Facilities Plan and EIS are of county-wide scope, encompassing several communities, numerous project alternatives, and many sensitive environmental factors. The length of the Draft EIS was commensurate with these conditions. The Greene County Final EIS summarizes and incorporates, by reference much of the information of the Draft EIS, and is thus not as lengthy.

W-15. See response to comment W-11.

W-16. One map cannot cover the engineering geology and soils properties for the entire planning area. Soils engineering properties, as they affect wastewater treatment facilities, are given in Table A-1 of the Draft EIS. Figure 8 of the DEIS shows generalized septic system soil limitations for the planning area, and DEIS Figures A-1, A-3, A-5, A-7, A-9, A-11, and A-13 show additional detail of septic system soil limitations for individual subareas.

Also, see response to comment W-12.

W-17. A corresponding revision to the Draft EIS is noted in Section III of the Final EIS.

W-18. EPA agrees and encourages improved on-site system management in the planning area.

W-19. Corresponding revisions to the Draft EIS are noted in Section III of the Final EIS.

W-20. Tabulations of construction materials, design life, and energy costs were not specifically included in the EIS, but are very much reflected in the cost-effective analyses conducted during facilities planning and summarized in the Draft EIS. Operational energy comparisons of the central collection and treatment alternatives are presented in the final Facilities Plan, and the proposed alternative for each subarea was the most energy efficient or among the most energy efficient. Further extraction and tabulation of this information for the numerous alternatives considered are not warranted since such tabulations would not reveal meaningful differences that are not already shown by the cost comparisons.

W-21. The detail of the EIS base maps is appropriate for the large area and planning nature of the study. Since the facilities planning alternatives pertain to outlying areas of Springfield and to the surrounding communities, additional detail on streets within Springfield would be of little value.

W-22. A corresponding revision to the Draft EIS is noted in Section III of the Final EIS.

W-23. The costs of replacement water supplies (or additional treatment) for the City of Springfield pose very complex hypothetical questions. Costs would depend upon the nature and degree of contamination, which of the City's various sources were affected, treatment process applications, and alternatives for new sources of supply. Water supply planning for the City of Springfield is based upon protecting the quality of existing sources, conserving and efficiently managing these sources, and providing additional new sources when needed. The proposed Greene County Facilities Plan actions are consistent with the protection of ground and surface water supply resources (and associated public health protection) in the planning area.

Planning by the City of Springfield in the late 1970's resulted in the new James River intake and Blackman Plant and the James River-Fellows Lake pipeline. Seventeen interim (2 to 20 years) source and management alternatives were screened or evaluated in the planning that led to these James River water supply projects. Four long-term (beyond the year 2000) water supply alternatives have also been identified: Table Rock Lake, Pomme de Terre Lake, Stockton Lake, or a new County Line Reservoir. A long-term source yield of 40 MGD would be adequate to about the year 2025. A new long-term source would supplement, not replace, existing sources. Early results of an ongoing Corps of Engineers study of these water supply alternatives indicate the Table Rock Lake or County Line Reservoir alternatives to be less costly than the other two. A preliminary estimate of the present worth cost of water supply storage in Table Rock Lake, and a pump station, booster pump station, and pipeline to deliver 40 MGD to Springfield is about $76 million. A comparable figure for County Line Reservoir storage with open channel transmission down the James River is $87 million.

W-24. Neither the proposed projects nor general development in the planning area will reduce total surface water flows. Water quality and runoff flow rates will be affected as discussed in the Draft EIS. Proposed discharges would increase base flows of some streams and would meet water quality requirements for agricultural use. The projects generally benefit the quality of ground and surface water resources. Future water supply developments and their impacts on agricultural or other water uses are not within the scope of this EIS.

W-25. Section II of the Draft EIS presents a summary of environmental conditions in Greene County, and is not an indictment of the effects of human development. Both Greene County and the City of Springfield have zoning regulations which control the type and density of developments according to various environmental and other planning considerations. The goals and objectives of the local governments are presented in their comprehensive (or master) plans. Also, see response to comment W-31.

W-26. The facilities planning stage and the associated EIS are nearly complete. Funding by the September 30, 1984 deadline also depends upon completion and approval of detailed design, local financing arrangements, and grant funding availability in accordance with the State of Missouri's priority list of eligible wastewater projects. The outlying unsewered communities in Greene County are unlikely to meet these requirements and obtain grant funding before September 30, 1984.

W-27. The "industrial development" category includes commercial activities and does not differentiate between "heavy" or "light" industry. Significant industrial development already exists within the Springfield southern system, and the EIS impact analysis does not infer that the nature of additional industrial development with the proposed projects would be different. The impact matrix indicates that sewer service could make some areas more attractive for industrial development, such as commercial strips, shopping malls, and industrial park type industries, if other development factors are favorable. Similarly, residential land uses may also be stimulated and predominate over industrial use. Industrial development in areas without proper wastewater disposal facilities can cause serious problems, such as those experienced at Litton Industries (Draft EIS, p. 78, par. 2) and the suspected industrial source of trichloroethylene contamination of well water at Republic (Draft EIS, p. 92, beginning par. 5, line 5).

W-28. The -1 impact indicates the projects would have minor negative impacts on Springfield's financing ability. The proposed new Northwest Treatment Plant is high on the State of Missouri's priority list for grant eligible wastewater treatment projects. In addition to grants and general obligation bonds, other potential methods of financing include revenue bonds, special assessments, and tax bills (see Draft EIS, pages 158-164). Funds collected from user charges and allocated for "replacement" may also be available.

W-29. See response to comment W-14. The Council on Environmental Quality (CEQ) guidelines pertain to a final EIS, not a draft EIS. The Greene County Final EIS summarizes and incorporates by reference much of the information of the Draft EIS and meets the intent of CEQ guidelines.

W-30. No response required.

W-31. EPA encourages improved on-site system management in the planning area, but does not agree that federal funding of the proposed projects should be contingent upon the adoption of a recommended regulatory management system by Greene County. Greene County does not have primary responsibility for the proposed projects for the various communities of the planning area, and it would be inappropriate and environmentally damaging to delay needed projects pending an ideal on-site system management program for the County. Also, Greene County, the City of Springfield, and Strafford already have important on-site system control and management elements in place.

In addition to its role in wastewater facilities planning, Greene County regulations, administered by the Building, Planning, and Zoning Department and the Zoning and Planning Commission, require all subdivisions in unincorporated areas with lot sizes of three acres or less to have central wastewater collection and disposal systems. The County requires professional certification of on-site treatment system sizing to obtain a building permit. The Greene County Planning and Zoning Commission has authority to control development in sensitive areas, such as a December 1982 ruling that would not allow septic systems at a proposed subdivision development in the McDaniel and Fellows Lake watershed, and required all wastewater generated to be removed from the watershed.

City of Springfield subdivision regulations require central collection sewers in all new developments. The City of Strafford passed an ordinance requiring all on-site treatment systems for new construction to comply with testing, design, and review provisions before issuance of a building permit.

W-32. The "vacant" designation for the Springfield vicinity is that used in the referenced 1976 Springfield Planning and Zoning Department study of land use by transportation zones. This study combined agricultural land, water, and truly vacant land into this category because further separation was not useful for traffic study purposes. For the EIS study, estimates of agricultural land, water, and vacant land areas of the entire planning area were made as presented and explained in the Draft EIS, p. 185, Table 24. These areas include the land in the immediate Springfield vicinity that is further detailed as to land use in Table 25. The phrase "in or near Springfield" refers to the "immediate Springfield vicinity" as defined in the 1976 transportation zone study and the Draft EIS: "The City (of Springfield) itself plus a ring of land about two to three miles wide around it, including Battlefield, Brookline, part of Willard, and unincorporated areas." Information to better define the irregular and non-specific boundaries of the transportation zone study is not available.

W-33. This statement is a policy or goal for planning and zoning purposes. EPA has no jurisdiction over land use, and the interpretation and administration of such zoning matters are determined by the Greene County Court through the Department of Building, Planning, and Zoning and the Zoning and Planning Commission.

W-34. See the response to W-32 for the meaning of "vicinity." EPA does not agree that 70 percent of the land in the referenced Springfield vicinity being undeveloped necessarily indicates either too large an area for workable planning or sprawling, low-density development. On the contrary, land use planning for outlying areas is important to prevent adverse environmental impacts and other problems that result from diffuse, unplanned development. Properly planned development of increased density has many advantages, one of which is to reduce the loss of farmland. EPA has found that the proposed projects are needed to serve existing development and growth areas, and are compatible with proper land use planning.

W-35. See the response to comments W-33 and W-34. EPA finds that the proposed projects will help to protect planning area water supplies and that the EIS presents adequate evaluation of indirect impacts upon land use.

W-36. EPA has no jurisdiction regarding the Greene County Comprehensive Plan and its administration; however, goals and policies for agricultural preservation are prominently stated in the Comprehensive Plan. As discussed in the Draft EIS, EPA finds that direct impacts on agricultural lands because of the proposed projects will be small. These impacts include those areas required for treatment facilities, pump stations, interceptors, force mains, and sewers. Land can still be farmed after being crossed by a sewer or force main. See the response to W-34 concerning indirect impacts on agricultural lands. Agricultural land use impacts from the proposed projects are more significant at the local level; impacts at the national level will be negligible.

W-37. A corresponding revision to the Draft EIS is noted in Section III of the Final EIS. Avoiding construction in sensitive geologic settings (areas underlain by caves or other features of Karst topography) is by far the most effective mitigation measure (see Draft EIS pg. 325, par. 3 and 5). Given the widespread occurrence of Karst topography in the planning area, some rock removal impacts on caves, springs, and other underground systems are unavoidable.

W-38. Although EPA (for federally funded projects) and the local wastewater management agencies have authority to control specific land uses including vegetation types on permanent sewer right-of-way easements, the individual landowners primarily determine these uses. Since there are significant costs in keeping such right-of-ways clear, they may be left unmanaged and return to their natural state unless there is specific incentive to keeping them clear.

W-39. See the response to comment W-14.

W-40. See the response to comment W-31.

W-41. See the response to comment W-37.

W-42. A corresponding revision to the Draft EIS is noted in Section III of the Final EIS. (The EIS recommends avoiding construction across known sinkholes and losing portions of streams. Other mitigating measures apply only if avoidance is not feasible.)

W-43. No response required.

W-44. The water quality parameters listed are subject to natural variation, but, except perhaps for nitrate, should otherwise not change appreciably. A corresponding revision to Table 7 of the Draft EIS is noted in Section III of the Final EIS.

W-45. A corresponding revision to the Draft EIS is noted in Section III of the Final EIS.

W-46. Noted. No response required.

W-47. In addition to stream impacts, ground water quality and socioeconomic (cost) impacts must be considered. Also, see response to comment W-74.

W-48. EPA is aware of the high costs in unsewered communities and that approval of the proposed projects does not assure federal and state grant funding or local funding. EPA is currently conducting a study of financing alternatives. The decisions on local funding ultimately lie with the citizens and their perceptions of the severity of the problem and their willingness to pay.

Several communities have voted recently on sewer bond issues. In February 1984, Willard voters passed general obligation and revenue sewer bonds with 81 percent in favor; Walnut Grove missed the margin needed for general obligation bonds by seven votes, but passed revenue bonds; and Fair Grove missed the margin needed for general obligation bonds by 30 votes, but passed revenue bonds. Battlefield voters turned down a proposition to upgrade its status from a village to a fourth class city, which would have provided additional bonding capacity. Plans for a sewer bond issue have been delayed pending another attempt to pass the fourth class city proposition.

W-49. Additional minor impacts to the water quality and aquatic ecology of the Wilsons Creek and James River system will result from adding Brookline, Battlefield, and Strafford to the service area of Springfield's Southwest Plant. The total 20-year projected average dry weather flow of 0.93 MGD for these communities is small compared to the waste loads and capacity at the Southwest Plant. Current average flow to the Southwest system is about 25.4 MGD (17.0 MGD dry weather flow) and is projected to increase to 35.7 MGD (26.8 MGD dry weather flow) by the year 2005. The average day design flow of the existing facility is 30 MGD. (Refer to p. 210, Table 29 of the Draft EIS.) The addition of wastewater from these communities will have little net effect on the receiving streams. In this case it is preferrable to add moderate amounts of additional effluent to a stream already impacted by effluent than to add effluent to a stream not currently affected.

No municipalities use Wilsons Creek or the James River as a potable water supply source between Springfield and Table Rock Lake. Most effluent discharge nutrients that reach Table Rock Lake are likely to be trapped in the reservoir sediments. Nutrient removal was considered in the 1974 Waste Load Allocation Study Report of Wilsons Creek and the James River, but was not required in the upgrading of the Southwest Plant and is not required to meet current effluent permit limits. The following is excerpted from the 1975 report:

> # Nutrients - The James River is highly enriched by nutrients discharged by the Southwest Plant. Algal growth exceeds natural levels and is limited by physical factors rather than nutrient availability. The most logical approach to limiting algal growth would be removal of phosphorus from the effluent of the Southwest Plant. Although the tertiary treatment presently being implemented will have little effect on nutrient concentrations in the receiving stream, the plant could be further upgraded to provide phosphorus removal by the addition of mineral salts. The effluent phosphorus concentration could be reduced to less than 1.0 mg/l for a total estimated cost of $50 per million gallons, or approximately one-half million dollars per year. There is no criterion for phosphorus contained in the Missouri Water Quality Standards, and the extent to which phosphorus reduction would reduce algal growth in the receiving waters is indeterminate except by experimentation. The extent to which fish productivity might be affected is also indeterminate."

W-50. No spills should occur at the new Northwest treatment site. Excessive wet weather flows would overflow to the stream via designed overflow facilities. Landfill leachate collection and treatment is planned as part of the construction of the Little Sac River interceptor (refer to comment W-3 by R. R. Schaefer, Superintendent of Sanitary Services, City of Springfield, and Section II-D of the Final EIS which discusses the landfills and proposed Springfield northern system facilities).

W-51. See response to comment W-42.

W-52. Corresponding revisions to the Draft EIS are noted in Section III of the Final EIS.

W-53. See response to comment W-4.

W-54. Corresponding revisions to the Draft EIS are noted in Section III of the Final EIS.

W-55. See response to comment W-5.

W-56. Corresponding revision to the Draft EIS is noted in Section III of the Final EIS.

W-57. Corresponding revision to the Draft EIS is noted in Section III of the Final EIS.

W-58. Corresponding revision to the Draft EIS is noted in Section III of the Final EIS.

W-59. Corresponding revision to the Draft EIS is noted in Section III of the Final EIS. Also, see response to comment W-12.

W-60. See response to comment W-42.

W-61. Orderly planning to meet future demands and discharge requirements with environmentally sound alternatives is the purpose of facilities planning for the Springfield southern system and the related EIS evaluation. Upgrading of the Southwest Treatment Plant in the mid-1970's dramatically improved the water quality of Wilsons Creek and the James River and the recommended Facilities Plan approach should help to maintain and improve upon these gains. The 20-year facilities planning period and the county-wide scope of the plan are intended to avoid short-sighted, inefficient, and uncoordinated decisions.

W-62. See response to comment W-11.

W-63. See response to comment W-12.

W-64. See response to comment W-16.

W-65. See response to comments W-11 and W-12.

W-66. See response to comments W-14 and W-29.

W-67. See response to comment W-8.

W-68. Such research was an important part of the Greene County facilities planning process.

W-69. Sewers are one of several important factors that influence (or follow) growth patterns.

W-70. Comment noted.

W-71. The Draft EIS explained the Draft Facilities Plan status at that time, and it is hoped the interchangeable use of the terms "Facilities Plan" and "Draft Facilities Plan" in some instances did not cause confusion.

W-72. "Land application" is a widely used term in both instances. "Land treatment" is also widely used to mean a method of wastewater treatment. The Facilities Plan generally used "land application" in regard to wastewater treatment; and, for consistency, the EIS also uses this term.

W-73. Comparative costs for the Fair Grove land application alternative were presented on p. 256, Table 36 of the Draft EIS.

W-74. According to the MDNR Division of Geology and Land Survey report on the alternative land application sites at Fair Grove, "a moderate to slow permeability is expected from the silty clay soils and low rate application of 12 to 18" of water per year is suggested for initial planning purposes." (As indicated in the Draft EIS discussion, the facilities plan design used an application rate of 15 inches per year.) The low application rate results in the need for a larger application site, which increases costs. In addition, costs of a storage basin to hold wastewater during cold and wet weather are substantial. A storage basin with 5-1/2 months holding capacity at the average design flow of 0.249 MGD would need to provide 126 acre-ft of storage. The facilities plan design is for a 12.6 acre basin, resulting in a design water depth of about 10 feet. Membrane lining of the basin is provided to prevent excessive percolation and ground water contamination, in accordance with MDNR requirements. While there have not been particular public objections to land application alternatives at Fair Grove, actual negotiations of agreements for long-term use of private land for this purpose may be difficult and could very well result in objections. If land were to be purchased for the application site, costs would be higher than those presented in the cost-effective analysis.

Land application is a technically feasible and environmentally acceptable alternative for Fair Grove, but costs appear unfavorable compared to other acceptable alternatives. A very similar situation exists at Walnut Grove. Fair Grove, Walnut Grove, and other unsewered communities in the planning area may not be able to implement their proposed wastewater treatment projects for some time and community conditions, funding alternatives, and technologies could change. Land application or other appropriate alternatives should not be ruled out, but should be re-evaluated as conditions warrant and more experience is gained concerning alternative collection and treatment systems.

In general, Greene County has various adverse conditions for land application in the form of low permeability and fragipan soils, sinkholes, shallow bedrock, steep slopes, losing streams, and less than ideal climate. Each potential site must be examined and evaluated as was done for the Facilities Plan and EIS evaluations.

W-75. Comment noted.

W-76. See response to comments W-14 and W-29.

W-77. EPA does not agree that the assumptions used in the population forecasts are poor. While more sophisticated methods (not those suggested in this comment) for population forecasting exist, they are not necessarily better. The ability of all methods to accurately (within a reasonable error) predict future population depends on the assumptions made, the availability of relevant and reliable information, and on the forecast period. The assumption that what has occurred in the past will probably occur in the future is not poor, certainly not for the planning area. The assumption implies that population growth will continue at its current and past rate. It also implies that economic conditions and the factors shaping them will be similar to the past. We have no information suggesting that future growth rates will be different. Given the long-term (30 year) stability of population growth rates in this area, the past serves as an excellent indicator of future population trends. Had there been less consistency in the historical record, forecasts based on the past would be more tenuous.

The planning area population projections developed for the Facilities Plan and EIS were compared with at least four other independent projections and were "middle of the road." The planning area projections were also within the allowable deviation from the State control totals.

EPA feels that the planning area and subareas themselves are the best model of an "area that has gone through similar development," and trying to find another similar area on which to base projections would be of no value. EPA has no jurisdiction over local land use or other means to set and govern growth.

W-78. See response to comment W-48.

W-79. See response to comment W-11.

W-80. The cost-effective analyses for all the subareas are conducted and presented prior to consideration of grant eligibility and potential grant funding. This provides an objective comparison of alternatives. Grant funding is considered later in determining user cost estimates for the most cost-effective alternative(s).

W-81. A corresponding revision to the Draft EIS is noted in Section III of the Final EIS.

W-82. Comment noted.

W-83. A corresponding revision to the Draft EIS is noted in Section III of the Final EIS. Required mitigation measures are discussed in the Executive Summary of the Final EIS.

W-84. Letters from the MDNR Division of Parks and Historic Preservation are included in this section following the written comment responses.

W-85. In accordance with subsequent communications between Mr. Lorenz of EPA and Ms. Huff, required mitigation measures for protecting bottomland habitat and preventing erosion and sedimentation are further specified in the Executive Summary of the Final EIS; however, quantification of bottomland impacts is not required.

W-86. Comment noted.

W-87. These impacts will go unmitigated. Also, see response to comments W-49 and W-74.

W-88. The only proposed projects that involve discharge to other river basins are those that route wastewater to the Springfield southern system. As described in the Draft EIS, Springfield's Southwest Treatment plant already provides ozonation to avoid impacts that would be associated with chlorine disinfection.

W-89. Little bottomland forest would be permanently lost by implementation of the proposed projects. Also, see response to comment W-38.

W-90. In negotiating a temporary pipeline easement, the City of Springfield reached an agreement with the Whites that allows the Whites to tap onto City Utilities raw water supply line from McDaniel Lake to the Fulbright Plant, and purchase water at a nominal rate. This will provide the White farm with good quality water during low flow periods and mitigate the loss of Northwest Treatment Plant effluent in this reach of stream.

Also, see response to comment W-50.

W-91. A corresponding revision to the Draft EIS is noted in Section III of the Final EIS.

W-92. See response to comments W-14 and W-29.

W-93. See response to comments W-14 and W-29.

Response to comment W-84.

MISSOURI DEPARTMENT OF NATURAL RESOURCES
P.O. Box 176 Jefferson City, Missouri 65102 (314) 751-2479

AUG 1 6 1983

August 11, 1983

Dr. Lloyd R. Young
Director
Center for Archaeological Research
Southwest Missouri State University
Springfield, Missouri 65804

Re: Proposed Northwest Interceptor and Treatment Plant Project (EPA), Springfield, Missouri; CAR-589

Dear Lloyd:

In response to your letter dated 9 August 1983, the Historic Preservation Program has reviewed the June, 1983 final draft report entitled "An Intensive Cultural Resources Survey of the Northwest Interceptor and Treatment Plant, City of Springfield, Greene County, Missouri" by Jack Ray and Burton Purrington. Based on this report, it is evident a thorough and adequate cultural resource survey has been made of the project area and we find the draft report to be acceptable.

In respect to the investigator's recommendations, we concur with the recommendations outlined on pages 63-64 of the draft report. If at all possible, the proposed project should be redesigned to avoid archaeological sites 23GR532, 23GR533, 23GR535, 23GR536 and 23GR537. If this is not feasible, the following course of action is strongly recommended. Sub-surface archaeological testing of the aforementioned archaeological sites potentially eligible for inclusion in the National Register, should be initiated with the results submitted to the Missouri Historic Preservation Program and to the Keeper of the National Register, Washington, D.C. to ascertain eligibility for inclusion in the National Register. This process is stated in 36CFR Part 63 Determination of Eligibility for Inclusion in the National Register of Historic Places.

In the event these sites are determined eligible, then the appropriate course of action as outlined in the Advisory Council on Historic Preservation's regulation Protection of Historic and Cultural Properties 36CFR Part 800, Section 800.4 should be implemented.

Christopher S. Bond Governor
Fred A. Lafser Director

Division of Parks and Historic Preservation
John Karel Director

Response to comment W-84.

Pending completion of this process, no action should be taken that would affect consideration of alternatives to avoid or satisfactorily mitigate any adverse effects on archaeological sites 23GR532, 23GR533, 23GR535, 23GR536 and 23GR537.

If I can be of further assistance, please call or write.

Sincerely,

DIVISION OF PARKS AND HISTORIC PRESERVATION

Michael S. Weichman
Chief, Review and Compliance

MSW:kld

cc: Terry Timmons

MISSOURI DEPARTMENT OF NATURAL RESOURCES
P.O. Box 176 Jefferson City, Missouri 65102 (314) 751-2479

October 31, 1983

Response to comment W-84.

Dr. Lloyd R. Young
Director, Center for
Archaeological Research
Southwest Missouri State University
Springfield, Missouri 65804

Re: Proposed County Wide Wastewater Treatment Facility Project (EPA), Greene County, Missouri: CAR-588

Dear Lloyd:

The Historic Preservation Program has reviewed the October 1983 report entitled "An Intensive Cultural Resources Survey of Proposed Wastewater Treatment Facilities in 10 Planning Areas, Greene County, Missouri: 1983" by David Benn and Jack Ray. Based on this report, it is evident a thorough and adequate cultural resource survey has been made of the project area.

We agree with the investigator's recommendations as outlined on pages 123-124 of the report. If at all possible, the proposed project should be redesigned to avoid archaeological sites 23GR538, 23GR539, 23GR540, 23GR544, 23GR546, 23GR547, 23GR548, 23GR549, 23GR550, and 23GR553. If this is not feasible, the following course of action is strongly recommended. Sub-surface archaeological mitigation of the aforementioned sites which are potentially eligible for inclusion in the National Register, should be initiated with the results submitted to the Missouri Historic Preservation Program and to the Keeper of the National Register, Washington, D.C. to ascertain eligibility for inclusion in the National Register. This process is stated in 36CFR Part 63 Determination of Eligibility for Inclusion in the National Register of Historic Places.

In the event these sites are determined eligible, then the appropriate course of action as outlined in the Advisory Council on Historic Preservation's regulation Protection of Historic and Cultural Properties 36CFR Part 800, Section 800.4 should be implemented.

Pending completion of this process, no action should be taken that would affect consideration of alternatives to avoid or satisfactorily mitigate any adverse effects on the above referenced archaeological sites.

If I can be of further assistance, please call or write.

Sincerely,

DIVISION OF PARKS AND HISTORIC PRESERVATION

Michael S. Weichman
Chief, Review & Compliance

MSW:jdc

cc: Terry Timmons

Christopher S. Bond Governor
Fred A. Lafser Director

Division of Parks and Historic Preservation
John Karel Director

B. PUBLIC HEARING COMMENTS AND RESPONSES

Public Hearing Comments Index

Comment(s)	Name	Agency
H-1 to H-3	Sherry Kensinger	Citizen/Greene County Wastewater Facilities Plan Citizens Advisory Committee
H-4	James Edwards	Citizen
H-5	Glenn Dillon	Citizen
H-6 and H-7	Helen Murray White	Citizen
H-8 and H-10	Darrell Lawson	Citizen
H-9	Randy Clarkson	Missouri Department of Natural Resources
H-11	Thomas Lorenz	U.S. Environmental Protection Agency

UNITED STATES OF AMERICA

ENVIRONMENTAL PROTECTION AGENCY

- - - - - - - - - - - - - - - - - -

In re: :

Public Hearing on Draft EIS :
for Greene County Wastewater :
Facilities Plan :

- - - - - - - - - - - - - - - - - -

Auditorium,
Springfield Art Museum,
1111 East Brookside,
Springfield, Missouri,

Tuesday, March 13, 1984.

The public hearing in the above-entitled matter was convened, pursuant to notice, at 7:00 o'clock p.m., Tim Amsden presiding.

BEFORE:

PANEL

TIM AMSDEN, Director of Special Projects, Environmental Protection Agency, 324 East Eleventh Street, Kansas City, Missouri 64106, Region VII.

TOM LORENZ, Project Officer, Environmental Protection Agency, Region VII, 324 East Eleventh Street, Kansas City, Missouri 64106.

ROGER JUNGCLAUS, Project Coordinator, Sverdrup and Parcel, Incorporated, 801 North Eleventh, St. Louis, Missouri 63101.

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P R O C E E D I N G S

HEARING OFFICER AMSDEN: On the record.

Ladies and gentlemen, my name is Tim Amsden and I am your Hearing Officer tonight. I am Director of Special Projects for the Environmental Protection Agency, Region VII Office in Kansas City, Missouri.

Tonight, March 13, 1984, we are holding a public hearing in the Springfield Art Museum auditorium to take public comments on the Draft Environmental Impact Statement for the proposed wastewater treatment facility in Greene County, Missouri. This hearing is being held pursuant to the requirements of Section 102 (2) (c) of the National Environmental Policy Act of 1969 and regulations promulgated pursuant thereto.

If you wish you may submit comments on the Draft EIS in writing from now until March 26, 1984. If you wish to provide written comments between now and March 26, 1984, please send them to the attention of Ed Vest, V-e-s-t, Chief, Environmental Impact Section, U. S. EPA, Region VII, 324 East Eleventh, Kansas City, Missouri 64106.

If you didn't get that address it is available inside the EIS or Cathy, at the door, can give it to you or any of us, after the hearing.

If you have any questions about the Draft EIS or anything else related to this process or the proposed wastewater treatment facility, after the meeting, the man on my right, his name is Tom Lorenz. L-o-r-e-n-z, and he is the project officer. He is a representative of EPA. His phone number in Kansas City, Missouri, is 816-374-5593.

I would also like to introduce Roger Jungclaus of Sverdrup and Parcel, Incorporated, the contractors who prepared the EIS. He's on my left.

Your remarks are being recorded by a court reporter, so as we get into the hearing please begin your remarks by identifying yourself and speaking clearly into the microphone on this side.

Some of you filled out cards, indicating your desire to make a statement and I will have those in hand when we get to the public comment period and I will go through them one at a time and I will call on each of you. If you haven't filled out a card and you would like to make a public statement Cathy, who is at the table outside the room, this door over here, will be glad to provide you with one. After we have gone through the cards we will see if there is anyone else who wants to make a statement.

Prior to opening it up we will hear from Tom Lorenz and Roger and then we will open it up to the public. We will start with Tom.

MR. LORENZ: Good evening.

My name is Tom Lorenz and I am the project officer for the Greene County Environmental Impact Statement. I am a representative of the U. S. Environmental Protection Agency, Region VII, located in Kansas City, Missouri.

You may follow this and Mr. Jungclaus's presentation on the handouts you received when coming in.

NEPA, the National Environmental Policy Act of 1969 requires an Environmental Impact Statement on any major federal action that can significantly affect the environment. Approving the Greene County wastewater facility plan and subsequent design and construction was deemed such an action. The scope of the plan, that is being a county-wide facility plan, the amount of interaction and inter-municipal agreements demanded by this type of a planning process, amongst eight different communities, the sensitive water resources in Greene County, the fact that Greene County is built on a divide and must pump a lot of its water, particularly Springfield is built on a divide, must pump a lot of its water uphill into the city and as a consequence of that their wastewater flows downstream, downhill, and has a potential to contaminate their water resources. The fact that this county is largely built on a Karst plain, Karst being a geological term used to describe areas that are characterized by losing streams, caves, sinkholes and underground water channels, the archaeological resources that occur along some of the waterways in this county and other environmental features, the effects on future development in this county and the existing problems of inadequate wastewater treatment and the number of failing septic tanks in the county, and the socio-economic cost and impacts on the local residents, the impacts of all of those particular factors were considered in this Environmental Impact Statement.

The Environmental Protection Agency has gathered data from all sources known to us, at the time, and to our contractor and presented them in an Environmental Impact Statement as a disclosure document to help the federal, state and local officials make the decisions that are best for the future of this county.

The EIS was prepared concurrently with the facility plan in an effort to try and cut down on the cost in terms of time. Generally speaking, when we prepare an Environmental Impact Statement,when a facility plan is already standing in place, it takes us 18 months from the time the facility plan is in our hands to come back with an Environmental Impact Statement and to follow through the whole process.

The communities cannot carry on in the Federal Grant process and receive federal monies until after the Environmental Impact Statement process is finished and a decision has been made.

Consequently, by doing a concurrent Environmental Impact Statement we can finish that process within about six months from the time the facility plan is in hand. At this point the final facility plan for Greene County has just been distributed.

A little bit of history here.

The initial facility plan grant was given by the Environmental Protection Agency in February of 1979. The EIS notice of intent was published in July of 1980 and an environmental study report was prepared by our contractors, as part of the EIS, and it was submitted to the advisory committee and to county and state officials on January of 1981. The draft facility plan development included a public participation program and in that program there were public meetings, questionnaires, news media releases and citizen advisory and committee activities and technical coordination with federal, state and local interests.

The draft facility plan publication and public hearings were held in July of 1983. Sverdrup and Parcel produced a preliminary draft Environmental Impact Statement for internal review by EPA and the Department of Natural Resources in October of 1983. The draft Environmental Impact Statement was published and distributed in February of 1984. We are now at the point where we are having the draft EIS hearing, March 13, 1984. Our next step will be the, our receiving the final facility plan. That has already taken place, it took place on Monday of this week and the next step we will take after this public hearing is to consider all comments that have been made on the draft facility plan, make modifications and changes in the EIS, where they are necessary, and then publish a final facility plan, excuse me, a final Environmental Impact Statement which will address the comments that were made. It will provide the changes that were necessary and also contain the transcript of the public hearing.

Thirty days after that has been standing and publicly distributed we will issue a record of decision, which will be the Environmental Protection Agency's decision on whether or not they approve of the proposed actions. If we approve of the proposed actions the Environmental Protection Agency will fund those actions with grant monies, as they are available.

If you will take a look at Page 3 of the handout you received there is a map of the planning area included in the Environmental Impact Statement. This map shows existing and proposed public wastewater facilities, service areas, some of the pipelines and other geographical features that will be of interest to us this evening you will note that a small portion of Christian County that is immediately adjacent to Greene County, which amounts to about 34 square miles, is also included in this.

Those areas that are not included in the Environmental Impact Statement, at this point, are Ash Grove, that part of Rogersville that is in Greene County and Republic.

Now, the planning area includes all of Greene County, except those areas that I mentioned. Originally nine subareas were designated for facility planning. They were Springfield, Battlefield, Brookline, Fair Grove, Republic, Strafford, Walnut Grove, Willard and the unincorporated low growth areas of the county.

The Republic subarea has recently been withdrawn from the EIS to expedite implementation of the recommended draft facility plan there, due to the possibility of a lagoon collapse inthat area.

I will now turn the rest of this over to Mr. Jungclaus who will go into some detail and the individual alternatives that were considered and some of the factors that helped make those decisions.

MR. JUNGCLAUS: Thank you, Tom.

As Tom explained, my name is Roger Jungclaus with Sverdrup and Parcel. Tom explained the EIS process and where we are and briefly how we got there. I would just like to give you an overview of the EIS analysis that was conducted.

First I will talk about in general terms the basic facilities plan and alternatives that were analyzed for this EIS and note the major environmental factors that played on these various alternatives on a case by case basis. Then I will discuss briefly the eight subareas in the EIS and the alternatives and the impacts that were the findings of the Draft EIS.

If you will turn to Page 5.

The principal alternatives that were addressed during the facilities planning process were a no action alternative, and in this case there were serious deficiencies for many of the subareas because of existing problems of on-site disposal systems or inadequate existing treatment systems.

Upgrading on-site disposal systems is an alternative for those communities that are not presently sewered.

Then central collection treatment and disposal alternatives were addressed and much of the decision making revolves around the different alternatives within this broad category. The types of collection systems for unsewered communities, whether gravity or pressure or vacuum collection systems. Economics are a key factor here. The extent of a given subarea that can be served. Again, economics play the vital role.

The alternative treatment systems and goingright along with that the alternative discharge pints of the various streams or the places on the stream where the discharge might be placed.

Oftentimes the treatment requirements will differ because of the nature of the streamand this has a big effect on the type of treatment system and the cost of that treatment system.

Land application was evaluated for the various subareas where central collection and treatment was considered and also regionalization alternatives serving more than one community with a central or a combined treatment and disposal system.

Those are the basic alternatives that we have looked at.

Now, if you will turn to the next page I would like to talk about the very significant, the major environmental factors in the Greene County area that played an important part in the determinations on the alternatives.

Certainly, as Tom explained, the water resources are limited and are very sensitive in Greene County. Losing streams are common. These are streams where a good part of the flow goes underground. The connection between surface water and ground water is very close and complicated.

Oftentimes streams are water quality limited. That means standard treatment is not good enough to meet the water quality requirements of the streams. They have a limited capacity to accept pollutants, so that additional treatment has to be provided. Ground water quality is critical because of the use of this for wells and relating to species that inhabit the underground environment and, again, the potential for pollution because of the close surface and ground water connections and this relates to Karst geology, which Tom touched upon. These first three are very closely connected, between, you know, ground water and surface water and geology.

Water supply watersheds are of critical importance. Again, the water resources are limited and with the development pressures around Springfield and the sensitivities of the water supply, both quantity and quality, it is a very critical issue.

Archaeological resources are another very major factor. Greene County is rich in both historic and prehistoric archaeological resources and many of these are located along the streams which were impacts from wastewater systems, you know, are concentrated. There are several rare and endangered species of wildlife. The Niangua Darter which is found in the Sac River basin streams. This is the drainage to the north, that goes to the Osage River. The Sac River and east, really. The Pomme DeTerre River is a stream with important populations of the Niangua Darter, which is listed as rare by the Missouri Department of Natural Resources and considered threatened by the U. S. Fish and Wildlife Service. It is a small bottom-dwelling fish.

Several species, cave-dwelling species or underground species, the blind cave fish, the blind crawfish and the blind salamander are significant.

Riparian habitats, those important wildlife resources along streams are important.

Efficient patterns of development, seeing that development proceeds in an orderly manner that the community can serve efficiently.

Certainly very important are the cost impacts on the residents, the socio-economic impacts.

Now, if you will turn to Page 7, we have listed the subareas, Springfield, Battlefield, Brookline and so forth and the major alternatives that were evaluated for these factors that I just talked about.

The proposed projects are those with an asterisk and the other ones listed are alternatives that were evaluated.

Very briefly I would like to go through these and explain what some of the highlights of the findings were.

For the Springfield subarea, various improvements and expansion facilities are noted here. Inflow and infiltration to the existing system is a major problem, both to the Springfield northern system, which is tributary to the Northwest Treatment Plant and to the southern system, which is tributary to the Southwest Plant, so one of the recommendations is a further study to locate these areas of excessive flows that overload the plant during wet weather.

On the southern system, major new facilities would include the Pierson Creek interceptor and an extension of the previously proposed interceptor. This would benefit water quality in the James River and Lake Springfield, serving areas that are now unsewered, but are developing quite rapidly, prime development areas. It would have some adverse impacts in that archaeological resources and impacts on bottom land habitat would be significant. In these cases proper mitigation would serve to ameliorate or reduce the impacts.

The Thompson Branch trunk is another sewer line that would be on the James River watershed near Lake Springfield. It would improve the quality of the James River and Lake Springfield and reduce problems from future development, as well.

Moving to the Northwest Treatment Plant -- the Southwest Treatment Plant, at this point, does not require any major improvements. It is basically doing a good job in meeting effluent standards most of the time.

The Northwest Treatment Plant does require major improvements. The current plant is overloaded and it is not really designed to meet the water quality limitations that are now imposed. This Sac River which it discharges to, the Little Sac River, is a water quality limited stream and improvements in water quality are needed to meet the water quality standards in that stream.

Several basic alternatives were evaluated. Upgrading the existing plant and two new sites, potential new sites. The selected alternative is a new site called the Murray site, about five miles downstream. It would involve an interceptor from the location of the existing plant down to the new plant and some significant impacts on archaeological resources would be related to that intercept.

Another interceptor -- let me say about the Northwest Plant, the Murray site. That is the site of an existing landfill, but the treatment plant would not be on an area that has been landfilled in the past. It is owned by the city of Springfield.

The South Dry Sac Interceptor would also serve prime development areas in the northwest system. This would be an interceptor extending up the South Dry Sac River from near where the existing northwest plant is.

Moving onto the Battlefield Subarea.

The selected or proposed alternative is pumping to the Springfield southern system. Benefits would be to water quality, due to the problems of onsite systems, it is an unsewered area and potential ground water quality, as well as surface water quality problems from this. There would be one archaeological site that would be affected from the proposed alternative and this would need to be mitigated.

Other alternatives that were evaluated included a treatment plant and discharge to the Indian Springs branch. This was a losing stream and also had potential archaeological impacts.

Discharge to the James River. This is a water quality limited stream. Essentially Springfield is discharging through the Southwest Plant to the James River system, Wilsons Creek and the James River.

Of course cost played an important role in these decisions, as well, so generally the proposed alternative was cost effective. Some of these systems were not cost competitive. For instance, land application was evaluated, but in the planning area it was found that because of the climate and the storage requirements and the soils and the very low application rates and also geological limitations on putting in holding basins, renewing basins for storage that land application was expensive and was not found to be competitive, even for the smaller communities.

A regional facility with Republic and Brookline was evaluated, but this did not look to be cost effective and, again, losing streams were involved for the discharge points.

I will try to go a little quicker now. I think you see some of the basic things we looked at.

Now, moving on to Brookline, again a regionalized alternative with pumping to the Springfield southern system was selected. Losing streams and poor geology and cost eliminated the other sites. Brookline is currently unsewered so this would involve a new collection system to serve a portion of the subarea.

Fair Grove, the alternatives involved discharges of the Pomme De Terre basin, several locations. The selected one is a tributary of the Pomme De Terre and an oxidation ditch and a clarification system is proposed with disinfection. All of the Pomme De Terre sites would potentially affect the Niangua Darter with the direct discharge of the Pomme De Terre being the most, having the most effect. Some of the other ones having a lesser effect. Mitigation should be considered, particularly on the chlorine disinfection, because chlorine is a potentially toxic material and effluent to wildlife. It is required for disinfection because it is a recreation stream that is used for body contact recreation, but consideration should be given to mitigating those effects on wildlife with dechlorindation or an alternate disinfection.

Pumping to Strafford was considered for a combined regionalized system. This was not found to be cost effective and land application, as I discussed earlier, was not found to be cost effective.

Page 8 lists the Strafford subarea alternatives. There are quite a number. Several involve discharges to streams that were found to be losing, Pierson Creek, Davis Creek and Broad Creek. Others involved discharge to the Pomme De Terre River basin, the south fork of the Pomme De Terre. This was proposed, one of these discharge sites was proposed in the draft facilities plan. There was concern about opposition -- well, there was opposition from some of the residents on the Pomme De Terre. There was also concern about impacts on the Niangua Darter and on some small impoundments on the stream and the city of Strafford decided instead to pump to the Springfield southern system, which is now the proposed alternative.

There was another route to the Springfield southern system that involved a gravity sewer down Pierson Creek. This was environmentally less attractive because of the impacts on the bottom land habitat and potential archaeological sites and inducing development in an area that would not be most favorable for development.

Walnut Grove, three discharge alternatives were looked at and all were found to be losing streams and the Sugar Creek alternative is now proposed. Additional treatment will have to be provided, because it is a losing stream. In addition to an oxidation ditch, clarification and chlorination filtration will need to be provided. Losing stream requirements are more strict than the general requirements for streams that aren't water quality limited or aren't losing streams.

Pumping to Ash Grove was not found to be cost effective and, again, land application was not cost effective.

For Willard the selected proposed alternative is pumping to the Springfield northern system, got to the airport interceptor and pump system and then to the Northwest Treatment Plant. Discharge of the Little Sac River, a treatment plant and discharge of the Little Sac itself was evaluated. This would be an acceptable alternative environmentally also.

Two other streams were found to be losing.

The unincorporated low growth subarea was also evaluated in the facilities plan in the EIS and measures to improve and upgrade surface and subsurface disposal systems are recommended. This is important in the Greene County area, because of the very real problems with the water resources, the geology and the soils and management of the onsite systems is something that should be considered by the county, better management.

Modification of wastewater systems to reduce the load on onsite systems goes hand in hand with good management.

So, in summary, as Tom said, the findings of the Draft Environmental Impact Statement are that the facilities, as proposed, the benefits far outweigh the adverse impacts and this takes into account proper mitigation of those impacts, as recommended.

The planning process was conducted so that there would be timely coordination on environmental impacts in the facilities plan so we would get to this point and have some concurrence on where we were headed. That's one of the main purposes of doing it this way.

Regionalization was found to be environmentally sound where is was economically feasible and four communities, Willard, Brookline, Battlefield and Strafford, as proposed, would be pumping their waste to Springfield for final treatment and disposal.

Now, cost to the unsewered communities would still be very high and many of these communities will have difficulty financing these projects. Each of the communities has elected to pursue central collection and treatment systems, in some cases scaling down the systems, but costs will be high and I know the communities and the planners for the communities are pursuring ways to try to reduce those cost impacts and they have pursued those throughout the facilities planning process.

We have presented some user charge figures on the table on Page 9 and also the table on Page 10. As you can see from the table on Page 9 estimates of local user charges for the unsewered communities are in the range of $60 a month and up and that is after grant monies have been estimated in the numbers. Nevertheless, I understand that several of the communities are still interested in going on. They do have some serious problems and they want to get on with doing the best they can on their projects.

These costs on Page 9 are given in terms of 1984 and 1985 dollars.

The costs on Page 10 and the comparisons with the EPA's threshold as to what a high cost project are, are cranked back to 1980 dollars when the criteria was developed, but as you can see, just for comparison purposes, the last column gives the EPA threshold percentage based on median household income, per cent of that income above which the project is considered high cost. For instance, Battlefield 1.75 per cent is considered the threshold percentage and the estimated user cost in 1980 dollars is 2.4 per cent.

Walnut Grove is 5.5 per cent, compared to a 1.5 per cent threshold percentage.

So certainly cost will be a significant impact.

That concludes my remarks on the over all highlights and findings of the EIS.

I think now we will try to get to the main purpose tonight, just to hear from the public.

HEARING OFFICER AMSDEN: As I call your name please come over to the microphone, on my left, and make your presentation.

The first card I have is from Sherry Kensinger.

STATEMENT OF SHERRY KENSINGER

MS. KENSINGER: Well, really, all I have to say about it is, I was on the Advisory Committee and I am glad that we had the chance to study water quality in Greene County and I hope we can protect and preserve our water for the county.

There are a few things on this report that I picked up on this report this evening that I would like to mention, beginning with Willard. I mean, beginning with Walnut Grove.

The people at Walnut Grove are currently trying to go to a Lockwood form of treatment and I think this should be looked at again. I wanted just to mention that. I am not involved in that too much, but they feel that that would

H-1

be the best way to go for their community out there and they asked me to mention that to you this evening. I have a list of those people that I will turn in on the written statement.

Then the Fair Grove subarea are interested in land application and I don't believe the Fair Grove citizens are really going to want to go with the Pomme De Terre tributary discharge. H-2

Once again, at the beginning of the Green County Sewer District Studies I and several people requested Rogersville be involved and they weren't. We still feel that was a mistake and I just want to put it on the record. H-3

I would like to thank the EPA for their work on this issue and I hope the Advisory Committee can get together and make a report jointly on their comments.

HEARING OFFICER AMSDEN: Thank you very much.

Next is James Edwards.

STATEMENT OF JAMES EDWARDS

MR. EDWARDS: I am from the Walnut Grove community. I don't live in Walnut Grove, but I live two miles south on Sugar Creek. I have mentioned in the meetings at Walnut Grove how Sugar Creek is a losing stream. I might add a few facts that weren't brought out before at the meetings at Walnut Grove.

When they put the gas or oil pipeline across the property north of us, between us and Walnut Grove, they blasted to put in that line and approximately 150 feet below where the pipeline crosses, when it is not real rainy, the water goes into cracks in the ground there where they evidently broke the limestone structure there. Up to that point the water had never stopped running down that stream and I have lived there for 30 years. After they did that, when it was not raining, it goes in the ground and every summer I go up there and I pack in concrete, dirt, rocks, anything I can to try to get the water to come on down so I can water my cattle.

This last summer I installed a plastic pipe for approximately 40 feet from a slight ledge drop off above where it goes in the ground in order to carry water on down to water my cattle.

This wasn't brought out in the other meetings there and if I had realized what tremendous impact all of this was going to take place on us and our neighbors down this creek I would have taken pictures showing this.

I asked at those meetings that an onsite survey be made to investigate these places down the stream where it goes in the ground. We received a card in our mailbox from a geologist at Rolla that he flew over in an airplane and he observed springs and he saw no place where the water went into the ground. I asked for an onsite inspection and even contacting me and I would go with whoever wanted to go and see this. On down below me the water goes in the ground.

In this draft Environmental Impact Statement, on Page 373, it plainly states that Sugar Creek is rated unacceptable as a discharge stream for their sewer.

It has been brought to my attention in the last few days that the site for the treatment plant at Walnut Grove will rest on a place that is cavernous and the sinkholes, anyway there are holes under there, and I would respectfully ask that this be very thoroughly checked out before permission is given for Walnut Grove to place a discharge plant, treatment plant, on this place. H-4

Also, on Page 315 of this same book, it makes mention of chlorine being used as a treatment and for additional treatments of sewer plants. Well, if you will check this page here it tells how chlorine can act as a poison going into the wells and water downstream.

Now, down Sugar Creek there, there are approximately, in that length before it goes into Cur Creek, 10 families or homes that are supplied by wells and springs in the very proximity of this stream. There is suggestion an alternative going northeast from Walnut Grove an unnamed creek. Now, if this will be checked out, Walnut Grove does not want to go the other direction because it is more expensive, but there are fewer people and families and wells that would be affected in that direction than there is down our way.

Also, on Page 93 of this same draft Environmental Impact book it makes mention of phosphates and nitrates. Now, at one of the meetings at Walnut Grove it was mentioned that nitrates and phosphates cannot be screened out or filtered out of the water going downstream. So this, in turn, if you read that page, tells the adverse effects on health of this going into our well water and I would respectively ask that this Agency consider very thoroughly these points in relation to a number of families living in this area in relation going to the opposite direction from Walnut Grove.

Now, I do not deny that Walnut Grove needs a sewer, they could really use it. I know it is going to be a tremendous expense for them. As I look around here tonight I do not see a single person, council, mayor or citizen of Walnut Grove, that is even interested enough to be at this meeting to find out what the situation is.

Thank you.

HEARING OFFICER AMSDEN: Thank you, Mr. Edwards. Next we will hear from Mr. Glen Dillon.

STATEMENT OF GLEN DILLON

MR. DILLON: I am Glen Dillon.

My experience over 35 years in the water well business started with the assumption that anyone anywhere in Greene County could drill a well on their property and get water, that it did not have to be chlorinated to be used. My belief has not changed. We have learned more in the last 20 years about the moon than we have about the ground water.

I have been doing some testing on water from wells, springs and lakes that catch the water from springs and have come up with some interesting facts on nitrates. H-5

This draft acknowledges the fact that more testing needs to be done. Most of the information on nitrates in this draft were taken from Mr. Vineyards' book on springs and the last testing was 20 years ago. In 20 years there have been many houses built in rural GreeneCounty and lots of them on one-acre tracts, yet my testing shows that the nitrate content of surrounding springs has improved in the last 20 years. We have spent money on studies and on investigations, but very little on testing. I found that the water in the branch next to Fulbright Springs has less nitrate than the spring.

About 50,000 people in Greene County filter their sewers through the use of septic tanks. They do a good enough job that the use of chlorine is not needed, to drink that same water. However, the sludge has to be removed and is usually dumped.

Over 100,000 people of Springfield drink water that needs to be chlorinated to be pottable. Springfield does just the opposite. They recycle their sludge and dump their affluent in losing streams.

My suggestions would be that the next landfill be placed in the Springfield water shed. If Springfield were to be told that the only way they could build another landfill would be that it had to be in their water shed, recycling of solid wastes would be the main issue of the day.

Humus is a soft pliable substance that is left from the decomposition of both human, animal and plant waste. Humus is the ideal way to filter water to remove nitrates. Septic tank laterals should have a coating of humus ladden soil in the bottom to filter out nitrates. I am a firm believer in sewer systems and I am a firm believer in land application. The recycling of solid waste could furnish, could move sludge by low pressure steam and pump it to farmland where our water could be recycled. I consider this draft to be like a computer. Would you put 20-year old information into your computer, if you knew that it changed every day?

HEARING OFFICER AMSDEN: Thank you, Mr. Dillon.

The next speaker is Richard Welch. Is Mr. Welch here?

(No response.)

HEARING OFFICER AMSDEN: If Mr. Welch is not present and doesn't want to make a statement that concludes the cards that have been filled out.

Is there anybody else who would like to make a statement or ask a question, at this time.

Yes, ma'am, would you step to the microphone, please.

STATEMENT OF HELEN MURRAY WHITE

MS. WHITE: My name is Helen Murray White.

I have to say, when we talk about the Murray site for a landfill I have to disclaim that that did not come from our farm.

We, unfortunately, are located in an area which is abutting the city of Springfield and the city utilities so that we are in a grip between the two. Our farm abuts McDaniel Lake and it also abuts the area by the Northwest Treatment Plant.

We have complained about effluent coming down the Sac River for a number of years and I suppose that I cannot complain, now that the Northwest Treatment Plant is going to be built, but I have asked a question of which I have not heard an answer and I have not read it in your report and that is, when the effluent is going to be moved across our field, through the trunk sewer, then I don't know how much water is going to be left in our river and I did not see

H-6

that addressed in your report.

MR. LORENZ: I am aware of the issue and I really can't tell you how much it is going to be there, you know. That is the South Dry Sac that feeds down in that area, it is a losing stream. It is going to be subject to run-off from the land and whatever is released from upstream impoundments.

MS. WHITE: I was under the impression that further on in this statement, in this study, that the statement was made that this was not a losing stream.

MR. LORENZ: Some parts of it are upstream where the existing plant is. One of the reasons they are moving that downstream -- well, I'll put it this way. One of the reasons they are building a new plant not only is to accommodate increased volume of waste waters coming to it, but also to provide a higher degree of treatment so that the effluent will be of higher quality.

That's not going to answer your question though and I am afraid I can't really answer your question, as to how you are going to provide -- I take it you are interested in water for your cattle?

MS. WHITE: Naturally, we are going to lose water in the stream for the cattle and because we have the problem with city utilities at McDaniel Lake and do not have water coming out there we envision no water across our farm and that is quite a problem.

Now, going along with this same question--

MR. LORENZ: I hate to point a finger at these guys, but I would take your fight to city utilities, they've got the water.

MS. WHITE: Well, I see, the city and city utilities are so entwined, one and the other--

MR. LORENZ: This really is a sticky question. As I see it, you are unhappy with the quality of the water coming down the stream and, on the other hand, you are unhappy if we dry it up and there is no water coming down.

MS. WHITE: I realize it is a Catch-22 situation.

MR. LORENZ: Yes, it is.

MS. WHITE: I have also a question about the Fulbright landfill.

There is leachate coming out from that landfill. That is going into the stream. I was under the impression that at least there is water right now, which is helping to dilute this leachate as it comes down the stream. I did not see anything in your report which addressed how the handling or who is going to be doing what to the handling of the Fulbright and the Murray landfill.

H-7

MR. LORENZ: O.K. The reason for that is that there is some -- O.K.

The facility planners here in town, Hood-Rich, were the ones that prepared the facility plan. They are not the ones that evidently are going to be building the Northwest Treatment Plant. As a consequence of that the plans and specifications for that plant have not been fully jelled yet.

It is my understanding, I think if you check with the city officials and city utilities that there is some talk, at this point, about laying a drain pipe, I believe, along the interceptor to pick up the--

MS. WHITE: That's across our farm.

MR. LORENZ: To pick up the leachate.

MS. WHITE: No.

MR. LORENZ: Not that. Wait a minute, not what?

MR. SCHAEFER: The city is going to attempt the construction of the interceptor sewer to install the leachate collection system, which will eliminate leachate getting into the stream, because we recognize--

MS. WHITE: Is that only at Murray landfill or--

MR. SCHAEFER: No, it's not. It is also at Fulbright.

MS. WHITE: All right, thank you.

HEARING OFFICER AMSDEN: Anyone else? Yes, sir.

STATEMENT OF DARRELL LAWSON

MR. LAWSON: My name is Darrell Lawson and I live here in Springfield.

I am just a little bit confused, wondering how the federal government, the state government and so forth can allocate money, give a grant to the city of Springfield, to build the Northwest Treatment Plant, whenever nobody abides by the law here. To explain what I am saying. The law says to be eligible for grant money that whenever a collection system is built everybody within a reasonable distance of that collection system shall hook onto it. That is not in force here.

H-8

Can anybody tell me how this grant money can be funded until they do abide by the law?

MR. LORENZ: I would believe that you are talking about local ordinances rather than federal ordinances.

MR. LAWSON: Well, the Department of Natural Resources, it is right in their regulations that a grantee must adopt that ordinance and enforce it. Now, the city of Springfield has such an ordinance, but they don't enforce it.

MR. LORENZ: We had planned on having a representative of the Department of Natural Resources here tonight, but evidently he couldn't make it.

MR. LAWSON: Yes, you've got one back here.

MR. LORENZ: Mr. Clarkson.

Randy, can you help us out on this question?

This is Randy Clarkson with the Missouri Department of Natural Resources.

MR. CLARKSON: The Clean Water Commission has adopted certain requirements that cities have to comply with before they are eligible for a grant. We do require that a city adopt a sewer use ordinance. The city is expected to enforce that, but there is little doubt in my mind to say that every city in the state of Missouri has required every home within 100 feet or whatever the ordinance says for every sewer line to be connected would be very naive.

H-9

In general, in our working relationship with the city of Springfield they have done an exceptional job of complying with the rules and regulations.

I see absolutely no reason for the department or the Clean Water Commission to take the position that they would not be eligible for grant funds.

MR. LORENZ: Thank you.

MR. LAWSON: I guess everybody is entitled to their own opinion, but a 50 per cent hook-up is not even good.

I want to ask you something else.

In these studies that have been done it says that land application is not feasible here for these towns. Now, go up here to Bennett Springs, which is about an

H-10

hours drive, and you figure out the amount of visitors that park and so forth -- back in 1979 it was equal to a town of 1,500. Now, they use land application there. I think they shut the park down Thanksgiving, don't they, and open it back up about the first of March, about 90 days. So if that was a town the town would not need over 90 days storage through the winter.

Now, there has been a lot of ballyhoo about Rogersville out here. Well, the figures that I've seen, by the year 2000 Rogersville is going to be about 1,400 or something. Now, I didn't measure off, outside of a windshield measurement, but it looked like Bennett Springs wasn't using over five or six acres to rennovate all the water. So, if that was true, maybe Rogersville needs 10 acres. Maybe Strafford out here would need 15 acres and nobody can ever tell me that you can't rennovate water on an alfalfa patch. After you go over here to the SC officer, Soil Conservation Office, they will tell you how many acres of alfalfa, corn, fescue is a deep-rooted grass, there is a jillion acres in Greene County that is suitable for that and a lot cheaper.

Now, another thing that comes to mind, every time we have a heavy dew, to be ridiculous, they have to bypass the Northwest and Southwest Treatment Plants here, but Mr. Schaefer will tell you there is nothing wrong with it because the water is diluted.

Now, why don't they just build a big hole in the basin out at Rogersville and don't put it through any kind of a treatment plant or anything, just every time it rains a little bit let out some raw sewage. I mean, if that is an acceptable method.

MR. LORENZ: We went into some details -- let's address land application first.

We went into some detail in the Environmental Impact Statement concerning the applicability of planned application in this area. We have very good figures on it, we know what the rainfall is in this area, we know how long storage we have to provide for it and what the application rates are and the numbers simply are not there.

H-11

You will note when you look in the EIS that some of the communities require 25 or 30 acres of storage and some number of hundreds of acres for land application at a rate of 15 inches per year. You can only land apply certain times of the year in this area and even though there may be a jillion acres of good grass in this area or alfalfa to receive that it is a matter of getting that treated water to those acres and finding people that are willing to accept it. So far none of those instances have been known to EPA or to the facilities planners in this area.

There is another limitation in Greene County too that is very, very serious and that is the potential for collapse. If you will remember some years ago there was a catastrophic collapse of a lagoon down in the central/south part of the state. In 1968 there was a catastrophic collapse of a lagoon in Republic. This area is underladen with weak geological structure. There are underground channels, active subsidence in the area and it makes the possibly of installing a lagoon a very high risk situation and it is certainly not worth what it would take, the EPA feels it is not worth what it would take to accept that as a trade off for the level of treatment that they would get.

As far as discharging at high flow rates, some states have experimented with this, but only in areas where the receiving streams went directly into large streams. I can think of one in Iowa, they require a meat packing plant to hold their waste water in lagoons over a period of time and discharge only in the spring, high run-off period, but they are only two miles from the Missouri River and it goes down across a flood plain into the Missouri River. It is not anywhere near analogous to the situations you have in Greene County, where almost all of your surface water in this area turns out to be a very valuable resource for the cities drinking water.

MR. LAWSON: I won't disagree with you, that you can have a sinkhole appear any place. They had one down in Florida where it wasn't even ever considered that it could happen.

Now, can you tell me that it can happen underneath the Southwest Treatment Plant?

MR. LORENZ: The sites for the treatment plants have undergone geological evaluation for their integrity and although I am not here to guarantee anything, I can tell you we try and minimize that risk, as much as possible, by doing our homework before we approve a site.

MR. LAWSON: You can make the same kind of a survey for a land application, sir.

Now, land application is right to the east of us, over here, the Department of Natural Resources. You can't argue with me on that.

MR. LORENZ: I have been there and I have seen that installation and I can tell you that there are certain generic differences between the situations used over at Bennett Springs and what you could adapt to this area.

MR. LAWSON: Well, they cut it out of the side of a hill. I have seen it. I have also seen Lockwoods up here, irrigated, run out on their golf course.

You know this is right and the law says, I think it is Public Law 95-200 or something like that, that says you are supposed to prove that it won't work.

Now, I'm a taxpayer and I would like to get something back for my taxes. I think, in the first place, before you ever finalize the EIS study is to check in and see whether people are obeying the law or not.

HEARING OFFICER AMSDEN: Thank you very much, sir. Anybody else like to make a statement?

MR. WELCH: Yes, sir.

STATEMENT OF RICHARD WELCH

MR. WELCH: Richard Welch, landowner, adjoining to the city of the new proposed Murray or new Northwest Sewage Treatment Plant.

It is beyond my comprehension that they can even think to be putting a sewage treatment plant in this location, which is and was a city dump, which to this day still leaks, whatever you want to call it, black sludge into Little Sac.

H-1

The area they used for the landfill has never been reclaimed nor touched. It smoldered for three to four years. Nobody in this room knows what is buried there. There is proof at the Fulbright landfill that there is toxic metal and something called cydadine acid, but nobody really knows what is in the Old Murray. I am saying there could be methyladian gas or just about anything. You can drive down there this evening and drive a wrecking bar into the soil and out oozes black pollution.

The only reason I can see the city to put the plant in there is because they own the land. Three years ago they tried to sell the land, no takers.

I called personally the Department of Conservation, which buys large tracts of land, and asked if they were interested. They were interested, but they said we could not touch it because we are afraid of what might come back on this acreage in the future years.

This area, North 13, has been raped since 1935 by the old treatment plant. They have three existing dumpsites. We have a terrible problem with the trash trucks. The city spends money on cleaning Highway 13. The existing dump, which is located six miles from there, is about to reach its limit.

Also, to my knowledge, Litton sewage, Airport Industrial Park, all this sewage is pumped from the airport to Fulbright. This is ridiculous. Why pump is 12 miles across the city to treat it? I don't know.

Also, is the city of Springfield going to get into the sewer treatment business for Willard, Rogersville, Strafford, Walnut Grove, bring all their sewage to our area and then treat it? It doesn't make sense. You would have more control over smaller plants at their home base than bringing it all to Springfield and having one great big fish kill on Little Sac. The Fulbright plant has had two

H-13

fish kills

Little Sac, which the Murrays were addressing earlier, if they shut Fulbright down will be dry. That's a fact.

The only reason the city wants to put this over here is to put up Ritter Springs flow, which comes out right where they want to put it, which Ritter Springs belongs to the city people, it's a park, 300 to 400 acres, beautiful. A lake is right opposite this river that they are going to want to put the treatment plant on. Everybody fishes in it. Nobody will fish in it if you put a sewage treatment plant in there.

H-14

When I bought my land, which adjoins the city, I checked the records. The city would reclaim this land. The city would put a park there. Nothing has happened.

There has also been rumors to control the dump, the existing dump, they are going to put this lagoon around it, catch the water, spray it back on there and retreat it. Another cost to the taxpayers money.

The Fulbright treatment plant, which is an existing plant, nobody has developed or built around it for years.

The Murray site, which they expect to put the new treatment plant, beautiful homes, people have reclaimed the land, made it look pretty and now they want to turn it back into a sewage treatment plant.

They did study earlier a side on Little Sac, over by the Conoco quarry. Nobody builds around Conoco quarry because it will crack your foundation. If they are going to treat sewage from the industrial park airport, which they want to expand and from Willard, that would be a very much closer location and wouldn't cost all that money to pump it over there and treat it and then dump it into the river and watch it go by right to the same area.

Also, all I have seen in the Springfield paper, for the last two months, is the fear of Rogersville sewage in people's drinking water.

Springfield is about to make its limit on their drinking water. They propose a Webster/Greene County line dam. If this is not feasible and never goes into effect their water will most likely come from Stockton Lake. Little Sac is Stockton Lake.

You caught me kind of short. I just read this in Sunday's paper. Where was the Environmental Impact Study when the Murray farm was allowed to let a landfill right next to a river, it killed fish for years. It still is.

That's about all I have to say. I just think it would be a total mistake to put it on the Murray farm. I don't know how the city proposes to get to their treatment plant, because you cannot drive on that land if there is any rain, you will sink to your axle. There is an old bridge that I would presume is ready to collapse and I have checked with people that have lived in the area for years and you just can't walk on it, it is red clay, plus the trash under it. It is very unfeasible.

I also inquired of the people at the Southwest Treatment Plant on odors and smell and they have it from the slush trucks that come in and out every day and from the plant and the city is never made anybody happy out there.

Thank you very much.

HEARING OFFICER AMSDEN: Thank you, Mr. Welch.

MR. LAWSON: Can I have one more minute?

HEARING OFFICER AMSDEN: Yes, you may.

MR. LAWSON: I have a bit of arguing to do with that gentleman about land application.

Now, it is a known fact that if you disinfect most waste you will find that there is absolutely no difference. Every component you find in one waste you will find in another waste.

HEARING OFFICER AMSDEN: Sir, let me make a suggestion. I think for a debate on land application we ought to hold that until a little later to see what people have to say as far as this EIS goes. Mr. Lorenz will be glad to--

MR. LAWSON: I will speak to your infiltration here.

Am I correct, you are talking about a 11 million gallon plant out there, this new Northwest Treatment Plant?

MR. LORENZ: Six and a half.

MR. LAWSON: Well, your collection system here in the city of Springfield, on the north side, to use farmer's lingo, it won't hold ear corn let alone shell corn.

This looks to me like a perfect example of a man buying a saddle when he doesn't own a horse. The plant you've got out there will take care of it in dry weather. In wet weather your 6½ million gallon, you had better build a collection system and then build a treatment plant.

HEARING OFFICER AMSDEN: Thank you very much.

Anybody else who would like to make a presentation or statement?

(No response.)

HEARING OFFICER AMSDEN: If there is nobody else that wants to make a statement I'll remind you that if you want to send us something in writing, either because of something you heard tonight or because of any other reason please send it to us by March 26, we will hold the record open until that time, and if you have any questions call Mr. Tom Lorenz.

MR. WELCH: Have you made your decision?

HEARING OFFICER AMSDEN: We have not. This is a draft Environmental Impact Statement. We are looking for information and comments, facts that we don't have or didn't have at the time we made the statement.

MR. WELCH: Have you made a tour of the site?

HEARING OFFICER AMSDEN: I have not.

If there are no other comments we will close this hearing and I thank you all for coming out tonight.

(Whereupon, at 8:20 o'clock p.m., the public hearing in the above-entitled matter was closed.)

CERTIFICATE

I hereby certify that this is the transcript of the proceedings held in the following matter:

Before: Tim Amsden

Title: Draft EIS for Greene County Wastewater Facilities Plan

Case No.:

Date: March 13, 1984

Place: Springfield, Mo.

and that this is a full and correct transcript of the above referenced proceedings to the best of my knowledge and belief.

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H-1. The Lockwood system is a particular manufacturer's type of center pivot spray irrigation system used for land application of wastewater. See response to comment W-74.

H-2. See response to comment W-74.

H-3. As discussed on p. 1 of the Draft EIS, the decision not to include Rogersville considered that Rogersville was developing its own facilities plan and is located mostly in Webster County.

H-4. Several investigations of the Walnut Grove alternative discharge sites were conducted by the MDNR Division of Geology and Land Survey, but some uncertainty still exists regarding gaining or losing receiving stream characteristics:

The unnamed Turkey Creek tributary north of Walnut Grove has been tentatively classified as gaining, but if the field survey were made during dry weather, it might be classified as losing. Doubt about the stream is further evidenced by this drainage area being characterized as having the highest collapse potential for a lagoon of the three plant sites evaluated for the Walnut Grove area.

The first two geologic investigations of Sugar Creek (11/10/81 and 03/30/83) indicated this stream was gaining, including the area of the pipeline crossing and elsewhere downstream. A subsequent investigation (09/19/83) indicated that the stream is gaining for approximately one and one-half miles from its headwaters (to approximately one-half mile below the existing pipeline crossing); in transition between a gaining and losing stream for the next one mile; and then becomes losing and remains that way until it reaches Clear Creek.

Considering the questions about the classification of both streams, MDNR determined (1/16/84 letter of Mr. Randy Clarkson) that the most cost-effective environmentally sound alternative is to construct a wastewater treatment facility at the Sugar Creek site. The selected alternative of the final Facilities Plan is a combination gravity and pressure sewer collection system and an oxidation ditch treatment system with clarification, filtration and chlorine disinfection. The system is designed to meet losing stream requirements. EPA also finds that the Sugar Creek alternative is the most cost-effective ($181,000 equivalent annual cost versus $210,200 for the unnamed creek alternative) means of providing protection of the subarea's surface and ground water quality, including private wells in the Sugar Creek area. Chlorine disinfection will impact aquatic life in the stream but will protect, not poison, ground water supply quality. Adverse impacts, if any, on ground water quality and local private wells are not expected to be serious; however, periodic monitoring of potentially affected wells before and after project implementation is recommended as a precaution, as indicated in the Executive Summary of the Final EIS.

H-5. See response to comment W-1 concerning nitrate data. Essentially all surface water supplies need to be filtered and disinfected. Septic tanks and absorption fields do not remove nitrate very effectively. Nitrate can be effectively removed using land application with nitrogen uptake by certain crops. Recycling of solid wastes for the Springfield area may certainly have merit and should be further considered, but is not with the scope of this EIS study.

H-6. See response to comment W-90.

H-7. See response to comment W-50.

H-8. See Mr. Clarkson's comments, H-9.

H-9. Comment noted.

H-10. The Bennett Springs conditions are very different from those in Greene County. See response to comment W-74 and Mr. Lorenz's comments H-11.

H-11. Comment (by EPA's Mr. Lorenz) noted.

H-12. See response to comment W-50 concerning the landfill leachate and Section II-D of the Final EIS which discusses the landfills and proposed Springfield northern system facilities.

H-13. With regard to the final Facilities Plan and EIS, only wastewater from Willard would be routed to Springfield's Northwest Plant for treatment. Strafford wastewater would be treated by the Southwest Plant and Walnut Grove would provide its own treatment facility. Facilities planning for Rogersville is not within the scope of this EIS.

H-14. Ritter Springs Park facilities are on forested higher ground across the Little Sac River and upstream of the Northwest treatment plant Murray site. The park facilities are not right on the river and the forested areas will minimize adverse visual impacts during the recreation season.

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